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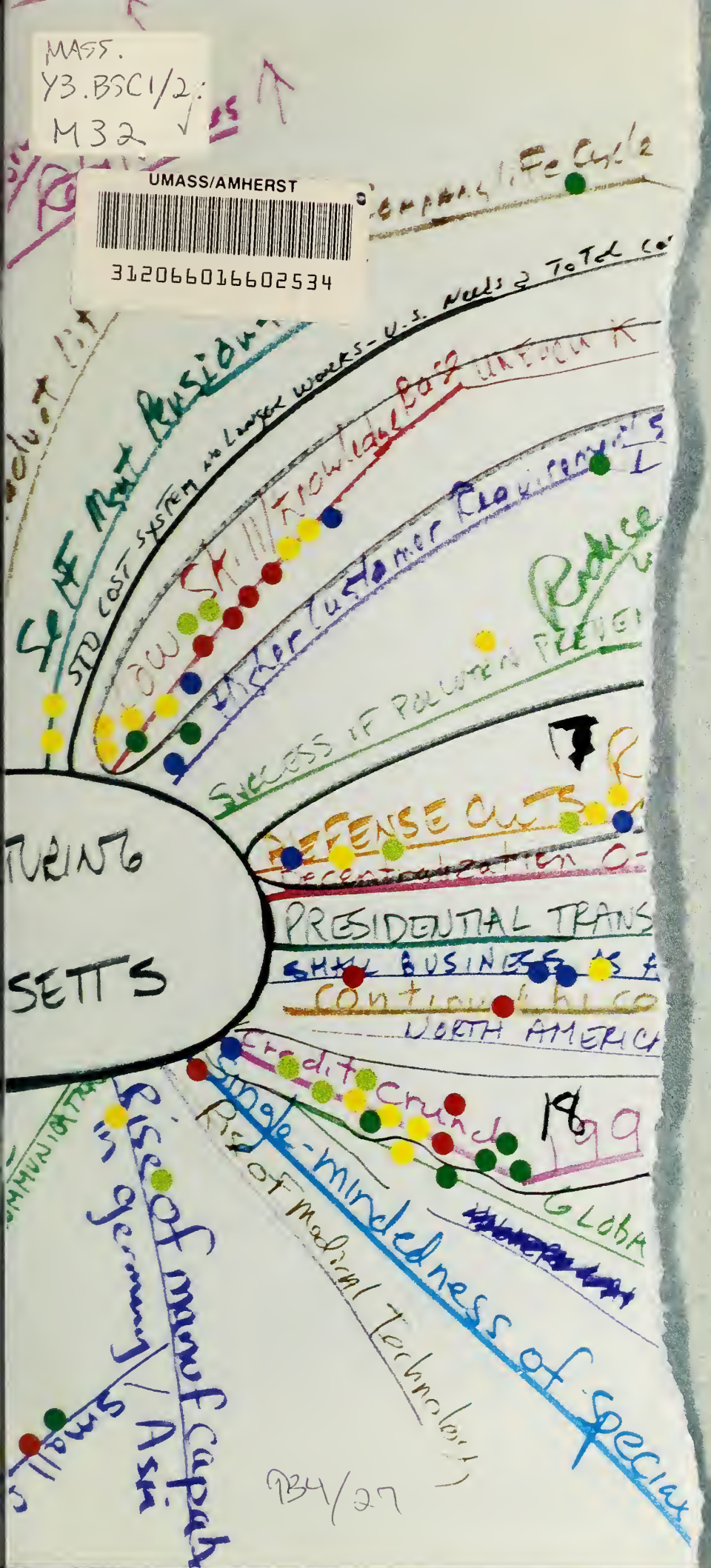

MANUFACTURING AND MASSACHUSETTS 2002

A Vision of a State-Wide Service System for Small and Medium-sized Manufacturing Firms

Bay State Skills Corporation

Bay State Center for Applied Technology

with

Tufts University

Tufts Manufacturing Resource Center

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MANUFACTURING AND MASSACHUSETTS 2002:

A Vision of a State-wide Service System for Small and Medium-sized Manufacturing Firms

A Strategic Futures Search Conference

DECEMBER 6-8, 1992

CONFERENCE SUMMARY REPORT

Supported by a State Technology Extension Program Planning Grant from the State Technology Extension Program of the National Institute of Standards and Technology Grant Number: 60NANBID1179

to

Bay State Skills Corporation
Bay State Center for Applied Technology

with

Tufts University
Tufts Manufacturing Resource Center

The Mind Map

A central element of the conference, the mind map illustrates the nature of the planning process. After all the participants, working in stakeholder groups, had a chance to contribute their analysis of manufacturing over the past thirty years to the present, a collective exercise began to establish key factors or themes affecting manufacturing. These themes and factors were "mapped" on a paper-covered wall and, eventually, formed a complex picture of the environment for all the stakeholders. It was a picture of over a hundred elements (e.g. environmental compliance, meeting customer standards, costs of doing business, financial crunch, and so forth). The map became an instant reference point for data that was the result of both the knowledge and experience of conference participants. More importantly, the map represented our collective view; it became the basis on which we carried out planning and achieved a common vision of what we should do to ensure a positive future for Massachusetts and manufacturing. *(See page 13 for a further discussion of the mind map's significance to the conference.)*

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August 1993

To: Supporters of Manufacturing in Massachusetts

Bay State Skills Corporation (BSSC) is pleased to present the conference report for "Manufacturing and Massachusetts 2002: A Vision of a State-wide Service System for Small and Medium-sized Manufacturing Firms." With thanks to our partners, Tufts Manufacturing Resource Center and the review board made up of conference participants, we feel that we have produced a document that provides not only an "as if you were there" accounting of the conference itself but also an initial examination of the issues and ideas that will make the creation of a manufacturing extension service system possible and successful in Massachusetts.

As you read this report, it will become readily apparent that momentum for supporting manufacturing is gathering. All of those who hold a stake in this enterprise are committed and have described the action steps that they are going to take. Our hope is that this report of their commitment and their plans will encourage other influential decision and policy makers to join the effort, thereby further ensuring its success.

I want especially to acknowledge John Hoops, Director of BSSC's Center for Applied Technology, for his leadership in the preparation and planning of the conference and as primary author of this report. Thanks also to BSSC staffers Kristie DePrete and Sue Paxman. Our partners in developing and executing the conference were Tuft's Leslie Schneider and her assistant Gail Melucci and Sandra Janoff whose mastery of the "search conference" technology made efficient use of the collective energies of over fifty people.

We are grateful to U. S. Senator John Kerry for his participation and enthusiasm for this effort, and we look forward to his continued support in Washington, D.C. We also look forward to "Manufacturing and Massachusetts 2002," a time when our manufacturing extension service network will have put our small and medium-sized manufacturers back into a position of competitive prominence, nationally and internationally.

Sincerely,

Erik Payne Butler
Executive Director
Bay State Skills Corporation

EXECUTIVE SUMMARY

Manufacturing is the foundation of Massachusetts's economy. Our diverse manufacturing base employs nearly one quarter of the private workforce in the state. Smaller firms comprise the vast majority of manufacturing firms. These smaller firms produce goods and services for local, national, and international markets. Responding to these firms' needs for effective development services, assisting them in retaining and expanding their markets, and helping them increase their competitiveness offers state policy makers avenues of supporting manufacturing growth. The unanswered question in Massachusetts is how we can organize effective services for manufacturing.

From December 6 to 8, 1992, Bay State Skills Corporation and its Center for Applied Technology and Tufts Manufacturing Resource Center brought together representatives of small and medium-sized firms, state officials, service providers, and educational providers to develop a common view of the future for manufacturing in Massachusetts and to plan for a technology and assistance service system. Participants represented the key groups that are stakeholders in the Commonwealth's manufacturing economy. The conference planning committee identified six stakeholder groups: manufacturers, educators, state and federal policy makers, publicly funded service providers, private service providers (including trade associations), and economic development groups. The committee also identified and recruited decision makers in each of the stakeholder areas. A total of fifty people attended the conference; nineteen were from manufacturing or were private service providers.

"Manufacturing and Massachusetts 2002" was the culmination of a year-long planning and development effort, sponsored by the National Institute of Standards and Technology's State Technology Extension Program. During that year, manufacturers, policy-makers, state officials, educators, and others involved in manufacturing services expressed their commitment to creating an extension service.

Our planning process, however, also encountered conflicting interests in a manufacturing extension service:

- Manufacturers expressed a strong interest in having services provided by government but were frustrated with the current lack of clear organization, the difficulty of access, and the seeming government indifference to manufacturing interests.
- Service providers expressed a strong interest in higher levels of coordination and in developing services for small firms but were reluctant to commit scarce resources or to shift current activities to accommodate new patterns of services for smaller firms.
- It became apparent that new methods of forging a consensus for action were

necessary to overcome fragmentation among service providers, to end hesitancy among decision makers, and to overcome the reluctance of manufacturers to engage the public sphere in dialogue about manufacturing's needs.

Although our planning had identified the elements of an effective service system and had tapped into a strong demand for such a system from industry, we could not, by ourselves, bring the pieces together. To address this critical need, we proposed a working "Strategic Futures Search Conference" that would include representatives of all the diverse, and sometimes competing, groups arrayed around Massachusetts's manufacturing economy.

A Strategic Futures Search Conference

Bay State Skills Corporation's Center for Applied Technology and Tufts Manufacturing Resource Center organized "Manufacturing and Massachusetts 2002" around a model of strategic planning called a "Strategic Futures Search Conference," which is task-focused and does not rely on expertise beyond that of the participants. The conference goal was to affirm collectively the Commonwealth's commitment to a technology and technical assistance extension service and to establish action plans for a collaborative state-wide network of services for small and medium-sized manufacturing firms.

During the conference, participants went through a series of structured activities to develop a pool of common information about the past, present, and future of small and medium-sized manufacturing firms in Massachusetts. The primary responsibility accepted by the participants was for the future—its creation, the action plans to achieve it, and the execution of those plans. To prepare to take on that responsibility, we answered the following questions:

The Past

- What factors and forces have shaped manufacturing, and what has been our role in manufacturing since 1960?
- What defined our economic and personal stakes in the manufacturing sector?

The Present

- What are the influences that affect successes or challenges to small and medium-sized firms today?
- What is our response to these influences?

The Future

- How do our perceptions of the past and present contribute to a single view of the future of manufacturing that encompasses the diversity of experiences and interests?
- Can we articulate a future scenario in which we can all participate?

Our answers to these questions produced a rich database of experience and interests. This database represents a comprehensive set of the forces that are shaping the competitive climate in Massachusetts for manufacturers, the way in which public and private services are provided, what we want these services to offer, and how we want to use them in the future. As part of the conference process, small groups worked together to pool their experience and ideas, analyze that experience and those ideas, and then present their conclusions to the larger group. By working in this way, we created an information database becomes the joint property of all participants and a common vision that wide guide our future efforts.

The Outcomes

Emerging from the common vision that "Manufacturing and Massachusetts 2002" created were the key elements for a manufacturing service program. All the stakeholders agreed that these elements were needed, and each stakeholder group identified what they could do to begin the development of the manufacturing extension program.

Through structured analysis, we generated a complex picture of the manufacturing environment. Because the picture was so complex, we spent a great deal of our effort identifying priorities. As we worked together, we developed a shared sense of the relevant outside forces, institutions, and issues that demand attention. They are

- The high cost of employment (insurance, health care, workers compensation)
- The credit crunch (and lack of investment capital)
- Supplier relationships/quality issues
- Availability of training and education
- Regulatory issues (costs of doing business)
- Response to defense cuts
- Lack of a state industrial policy/coherent action to assist business

From this list, each group identified key themes that we need to address right now. In rank order, across all the groups, the highest priorities are

1. Education and training
2. The credit crunch (and lack of investment capital)
3. Lack of a state industrial policy/coherent action to assist business
4. Regulatory issues (costs of doing business)
5. Supplier relationships/quality issues

The Manufacturing Extension Service System Design

During the conference, working groups created and presented scenarios of their vision for a technology and industrial extension service in Massachusetts. Drawing on the data from these scenarios, we identified the important building blocks of a state-wide manufacturing service system. The task was surprisingly easy. By thinking creatively and describing our ideal future, we rapidly outlined a consensual vision for manufacturing and for the role of a manufacturing service system. The following represents the common themes around which we can design and build an effective technology extension service system for manufacturing.

POLICY DECISIONS AND PRINCIPLES

- State leadership needs to develop an industrial policy.
- The state needs to commit to forming an extension service system.
- The customers of such a system are small and medium-sized manufacturers.
- Industry driven/focused leadership and partnerships are needed.
- The leadership of the system has to focus on industry needs and be part of the partnership between industry and government.
- Multiple sector partnerships—made up of government, industry, education, and public sector groups—are necessary.
- Service providers must be able to rely on stable funding to develop a long-term, coordinated system.

MAJOR TASKS AND ADVOCACY ISSUES

- A world-class system is a major goal.
- The manufacturing base needs to be stronger and bigger.
- Manufacturers need access to real money, including:
- a venture capital pool
- company-to-company joint ventures
- tax incentives
- changes in the incentive system to reward collaboration among service providers and companies.
- A continually evolving, flexible vision or strategy is best.
- The education system needs to be enhanced to provide appropriate workforce skills training and the continuous upgrading of programs.
- Apprenticeship programs are needed.
- The economic environment needs to focus on nurturing manufacturing and people in manufacturing.

ORGANIZING DIRECTIVES

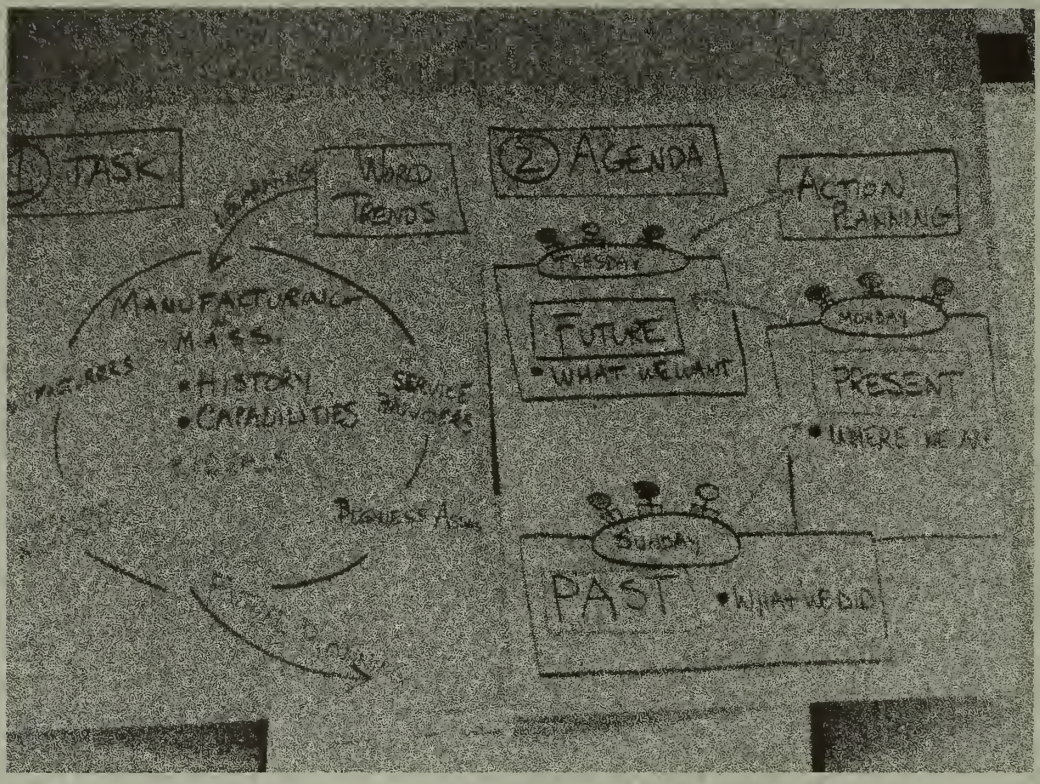
- The system should offer a regional delivery mechanism but be organized state-wide. [This discussion led to the idea that to recognize regional economies and the diversity of their contributions to the state economy there should be both regional and state-wide system.]
- A one-stop manufacturing resource center is needed.
- A quick, easy reference system is important; one call to the center(s) should be all the contact that is needed to access information from the rest of the system.
- The network approach to providing services has to include companies networking with each other as an integral part of the system.
- A computer infrastructure is needed to maintain the system's flexibility and to provide access to information in a user-friendly, efficient, and timely fashion.

MANUFACTURING SERVICES TO BE PROVIDED

- Qualified, experienced staffing
- Funding assistance
- Business strategy and planning assistance
- Research
- Technical assistance
- Workforce training
- Training of government/technical assistance providers
- Global market information
- Regulatory assistance
- Quality/benchmarking information
- A team approach

The Goal of the Conference Report

This report, reviewed by a volunteer subcommittee of conference participants, is written to provide three kinds of information: first, a glimpse into the high quality and depth of the information generated during those three days; second, the specification of key priorities and concerns shaping manufacturing today; and, finally, a summary of the elements of a manufacturing technology extension service plan for Massachusetts. It is our hope, the expectation of the conference participants, and the growing interest of many others that this document will serve as a guide to establishing a manufacturing extension system in Massachusetts.


TASK
WORLD TRENDS
2 AGENDA
ACTION PLANNING
MANUFACTURING
MASS.
• HISTORY
• CAPABILITIES
SERVICE PROVIDERS
FUTURE
• WHAT WE WANT
PRESENT
• WHERE WE ARE
PAST
• WHAT WE DID

I. Introduction

Manufacturing is the foundation of Massachusetts's economy. Our diverse manufacturing base employs nearly one quarter of the private work force in the state. Small and medium-sized firms make up the vast majority of manufacturing firms. These smaller firms produce goods and services for local, national, and world markets. Policy makers, within state governments and at the federal level, recognize that these firms are critical to the health of manufacturing now and that they may drive the growth of manufacturing in the future. Responding to these firms' needs for effective development services, assisting them in retaining and expanding their markets, and helping them increase their competitiveness offer Massachusetts policy makers concrete ways of supporting the growth of manufacturing and manufacturing employment. The unanswered question here is how we can organize effective services for our smaller manufacturing enterprises.

From December 6-8, 1992, Bay State Skills Corporation (BSSC) and its Center for Applied Technology (BSCAT) and Tufts University Manufacturing Resource Center held a planning conference for fifty representatives of small and medium-sized firms, state officials, service providers, and education providers. The goals were to develop a common view of the future for manufacturing in Massachusetts and to plan for a manufacturing extension service system. Employing new techniques in strategic planning, this conference was the culmination of a year-long BSSC and BSCAT planning and development effort, sponsored by the State Technology Extension Program of the National Institute of Standards and Technology (NIST).

During that year, manufacturers, policy makers, state officials, educators, and others involved in manufacturing services expressed interest in and commitment to creating an extension service; however, it also became apparent that we would have to discover methods of overcoming fragmentation among service providers, ending hesitancy among decision makers, and overcoming the reluctance of manufacturers to engage the public sphere in dialogue about their needs.

In our planning, we found conflicting demands on the support for a manufacturing extension service. Manufacturers expressed a strong interest in services provided by government but were frustrated with the current lack of clear organization, the difficulty of access, and the seeming government indifference to manufacturing interests. Service providers expressed a strong interest in higher levels of coordination and developing services for small firms but were reluctant to commit scarce resources or to shift current activities to accommodate new patterns of services that addressed the specific needs and scale of smaller enterprises.

After nearly a year of preliminary work in the public and private spheres, we realized that many were interested in creating an extension service, but that neither the manufacturing community nor the government service providers

knew how to move forward. And, it was clear that no single organization could initiate such a new and important program without participation from other key players. Our planning and discussion helped us identify the elements of an effective service system and tapped into a strong demand for services from industry, but we could not, by ourselves, bring these pieces together. We needed to find methods of allowing the parts of the whole to come together voluntarily and to create a new opportunity for a more unified set of manufacturing services.

Our solution was to create such an opportunity through a working "Strategic Futures Search Conference" that included representatives of all the disparate and sometimes competing groups in the manufacturing economy. Our task was to define a common vision for the future of manufacturing services and manufacturing growth in Massachusetts. Out of this vision, defined collectively, could come an action plan to which we could all claim ownership and help make real.

A Strategic Futures Search Conference

A "Strategic Futures Search Conference" is a task-focused planning effort. It does not rely on "outside experts." Instead, a search conference relies on the knowledge and the experience of people who must work in and change systems. This conference model has been used by firms to define better customer service strategies, by labor-management teams, and by cities for development planning. Ours was the first search conference to focus on the public/private intersection of manufacturing development.

Our goals were to affirm collectively the Commonwealth's commitment to a technology and technical assistance extension service and to establish action plans for a collaborative state-wide service network for small and medium-sized manufacturing firms.

ORGANIZATION AND STRUCTURE

During the conference, participants went through a series of structured activities to develop a common pool of information about the past, present, and future of small and medium-sized manufacturing companies in Massachusetts. The ground rules for the conference were fairly simple: to build not to complain and to take responsibility for managing our own information. The processes for all our work tasks were similar: we would generally work in groups, and each group would manage its own work, including keeping track of time, leading its own discussions, producing plans, recording results, and reporting outcomes to the other groups. A team of facilitators, skilled in search conference techniques, managed the conference. They worked to keep the groups focused and to keep tasks on schedule and to make sure that our planning efforts were moving toward a consensus on the future. Our responsibility as participants was to develop a vision of the future: its creation, the action plans to achieve it, and the

execution of those plans. Our mission was not to solve past problems but to identify what we should and could do together.

To achieve this we analyzed the past, present, and future of manufacturing, using the following kinds of questions:

The past

- What factors and forces shaped manufacturing and what was our role in manufacturing since 1960?
- What defined our economic and our personal stake in the manufacturing sector?What experiences did we have in common?

The present

- What shapes the successes or challenges for small and medium-sized firms today?
- What is our response to those influences? (Our individual perceptions of and experiences in manufacturing may overlap.)

The future

- How do our perceptions contribute to a common view of the future of manufacturing that encompasses the diversity of experiences and interests?
- Can we articulate a future scenario in which we can all participate?

Answers to these questions formed a database of experience and interests that included a comprehensive list of the forces shaping the present and future climate for Massachusetts manufacturers. By presenting our conclusions to the larger group, the information became the joint property of all participants, and a common view emerged. Much of the work of the participants focused on distilling information to the key themes and priorities that should be the core of a manufacturing service program.

PARTICIPANTS

Conference participants represented key stakeholders in the Massachusetts manufacturing economy. A conference planning committee identified the major stakeholder groups and the decision makers within the groups who could commit to action steps and plans. These were the individuals recruited to the conference. A total of fifty people attended; nineteen represented manufacturing firms or private-sector service providers.

The stakeholder groups were

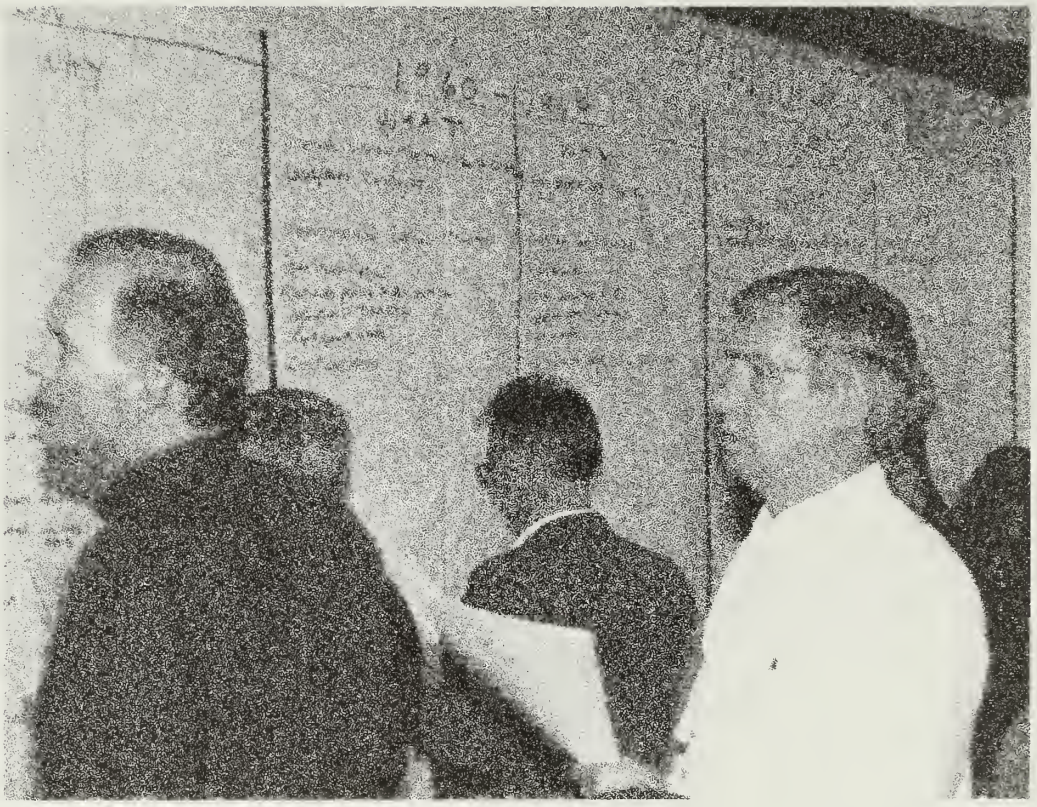
Manufacturers (two groups)
State and Federal Policy Makers
Private Sector Services
State and Federal Service Providers
Educators
Workforce Development Providers
Business Associations

(For a list of the planning committee members and the conference participants, see Appendices A and B.)

The Outcomes

"Manufacturing and Massachusetts 2002" succeeded in creating a common platform from which we could together state our vision of the future — what we all wanted to happen and what we are willing to work for. We identified key elements for a manufacturing extension service program that all the stakeholders agreed was what we needed and what we could provide. Finally, each stakeholder group made a commitment to make these elements a reality.

This report, reviewed by a volunteer subcommittee of the conference participants, provides three kinds of information. First, the report gives those not in attendance a glimpse into the high quality and depth of the thought and data generated during those three days. Second, it identifies the key priorities and concerns that are shaping the manufacturing climate. Finally, this report summarizes the elements of a manufacturing extension service program for Massachusetts. It is our hope, the expectation of the conference participants, and a part of the growing interest of many others, that this document can serve as a guide to establishing a manufacturing extension system in Massachusetts.



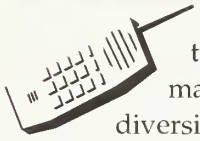
II. The Past

Describing the Past

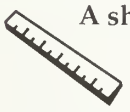
One path toward a consensus about future action is to develop a shared view of history, to share our personal histories with others, and to appreciate how various groups understand their current roles based on their recent histories. From the small manufacturing company owner who took over the family business to the commissioner of a large state agency, each of us brought to the conference, as we do in our professional lives, perceptions of the experience in our fields and about our own professional history. This lineage informs our values and our view of what we should be doing and what we will likely be doing in the future. And so, our work at "Manufacturing and Massachusetts" began a review of the past.

At "mixed" tables, which included at least one member from each stakeholder group, participants spent a few minutes sharing the "conference symbol" that each had brought. These symbols were any physical object that somehow represented his or her experience in manufacturing, in economic development, or in the providing of services to manufacturers. Each table selected one symbol to present to the other groups. Because these symbols gave an immediate and tangible view of the perceptions and roles of our colleagues, we began to learn things about each other and were ready to discuss our past histories.

Symbols of Manufacturing in Massachusetts



A cordless, cellular phone: The phone represents an opportunity to Massachusetts in the growing telecommunications market — for continued commercial production and for the diversification of defense-related companies to new products. It also symbolizes how communication is a critical factor in the success of companies — communication between employers and employees, between managers and customers, and among companies.



A short metal ruler: The ruler with its divisions in inches and centimeters represents an old instrument that is still appropriate and useful for a variety of tasks today. It also represents precision and accuracy — ideals that we have let go over time. We need to take these ideals back, to become much more proficient and accurate, and to strengthen the commitment to manufacturing.

A roll of red tape: Brought by an economic development stakeholder, the tape depicts the prevailing perceptions of the role of government in the state's business environment. There is a real need to cut through the red tape of regulations and state programs, to change the adversarial attitude of state and local government toward business needs, and to learn how to grow manufacturing in Massachusetts.

A compass: This symbol conveys the need for direction in determining where manufacturing should go in the Commonwealth.

A piece of fabric: The fabric symbolizes the association that one participant has with manufacturing — her parents both worked in the textile mills. The near extinction of this industry in Massachusetts should serve as a warning of what can happen not only to manufacturing but to families who depend on manufacturing for their livelihood.

A metal part used in the processing of cotton seeds: This machined piece was manufactured in the state for over 100 years but no longer. Many older, traditional manufacturing operations have moved out of state due to the high cost of workers' compensation and other regulations and the de-centralization and outsourcing of manufacturing operations.

A T-shaped metal part: This symbol part represents a small manufacturer's existing inventory. Customer pressure to move inventories to lower levels in the manufacturing chain creates a financial burden for the small supplier.

A simple, yet broken, part of a complex machine: This part represents the state of thinking in Massachusetts about manufacturing and its relation to the rest of state's economy. If the part stays broken the machine will not work: we need to fix manufacturing in Massachusetts, or the whole system will grind to a halt.

Focusing on the Past

Our first analytical task was to describe the past. We needed to discover how we and our manufacturing economy got to the present; what elements brought us here, and what elements shape our professional and economic lives today.

First on paper at our tables and then on paper that covered the walls around the large conference room, each participant listed memorable events, turning

points, and major happenings from each of the past three decades — 1960s, 1970s, 1980s — and why these occurrences were important. We were asked to categorize these events from four perspectives.

1. What did we as individuals do or experience?
2. What happened in the small and medium-sized manufacturing sector?
3. What happened in economic or workforce development practices?
4. What happened in society at large?

On paper covering the walls from floor to ceiling, we wrote down our own most significant points or milestones. As we wrote, we described ourselves, our education, our jobs, and our families. We identified significant milestones in manufacturing such as the decline of mass production, the decline in the numbers of large New England employers, and the rise of defense dependence. We wrote of the changes in population and social life. We also walked around the room and read the history being written. Our common perception of the past was beginning to develop.

Analyzing Our History

The walls of the conference room rapidly filled with historical data; the next step was to identify and interpret themes and patterns about our past. Each group was assigned one of the sectors Self, Manufacturers, Economic/workforce Development, and Society and, in discussion, asked to identify the trends and developments in that sector since 1960.

This in-depth analysis of our past brought out and emphasized the commonality of experience and perspective among this diverse group of stakeholders. Of particular importance was the shared view that the long-term health of the manufacturing sector could not be distinguished from the social benefits of training and human development. The following is a summary of the analysis:

Self

As we described ourselves, we discovered similarities between those in public and private employment. We share high levels of education; some of us are entrepreneurs who have found careers in firms and in the public sector. A large number of us had become senior managers by the 1980s. We are committed to our fields; we are active in our professions.

What emerged was a picture of a group committed to professional and managerial responsibilities and experienced in turning ideas about products, technology, economic development, and human development into practice.

Manufacturing

Many of us described Massachusetts's manufacturing sector as marked by two significant trends over the last three decades. First, the growth of the military has

resulted in over-specialization and over-dependance on defense-related technologies and processes; second, decline in conventional manufacturing industries and techniques has weakened our competitive position.

We also identified our manufacturing strengths and weaknesses: U.S. manufacturing is good at technology and innovation but has lagged in the ability to bring new products to competitive markets. As a result of our reliance on high volume, low-value-added manufacturing up to and through the 1960s, high-value-added manufacturing, a source of innovation and growth, suffered. In the 1970s and 1980s, we watched as high wage jobs were lost and the creation of newly skilled, up-to-date workers declined. Now, we face a loss of our competitive edge in the world markets of the 1990s. It is hard for U.S. and Massachusetts manufacturers to make up this deficit on their own because of the many business regulations that increase costs and because of the fragmentation of the efforts of small and medium-sized firms.

We also saw positive developments in the trend of the 1980s toward smaller manufacturing companies. These companies bring with them new technologies and new jobs. However, their need for increased training and investment and help with the adoption of total quality practices creates a new role for economic development that has yet to be fulfilled. Competitors from across the country as well as the world enjoy stronger government support.

With this in mind, some issues that should be included at the top of discussion for the 1990s are the need for investment in long-term performance versus short-term returns; the need to focus now on customer requirements and not just on day-to-day production issues; and the need to define the role and value of smaller enterprises in the economy.

Economic and workforce development

We all felt the overwhelming need to revitalize and refocus our efforts in this area and agreed on the changes in the economic climate that shape the perceptions of the business and economic development communities.

The workforce has grown in size and diversity due primarily to the maturity of the baby-boomers and the entrance of women and immigrants into the labor pool. In addition, the private sector has, in significant measure, democratized its approach and brought new populations into the workforce, particularly in manufacturing.

Economic changes in this period include those in the international monetary system, globalization, the declining membership in unions, and the lack of capital for investment in manufacturing. The financial focus has been on short-term debt, real estate, and high short-term returns; the corporate merging frenzy ate up investment funds. Computer-based and information technology has grown dramatically, and rapidly, making it hard for smaller firms to keep up.

The growth of high-tech industries, the globalization of the economy, and the decrease in market size has resulted a dangerous trend and in the view of some an unnecessary trend, toward dichotomy in work skills: highly educated or low

in skill. We ended the 1980s fearing that the U.S. would lose its position as a leader in the world economy if we didn't do something.

The group agreed that national and state leadership lacks direction in the field of employment and training. The Great Society produced training programs aimed at reducing inequality. Later, many of us shifted our professional emphasis to promoting skills that contribute to economic growth. We sought ways to revitalize the community college system, to promote in-company training, and to foster more innovative programs for entry level training. Now, many of us share the view that the Reagan administration was short-sighted, crippling some of these programs, and has left us limited in our ability to meet the need for a skilled workforce now and to train future students who may not wish to attend college. Others feel that this inability is the result of the current economic conditions and may have the long-term beneficial effect of encouraging service providers to make better use of scarce public resources.

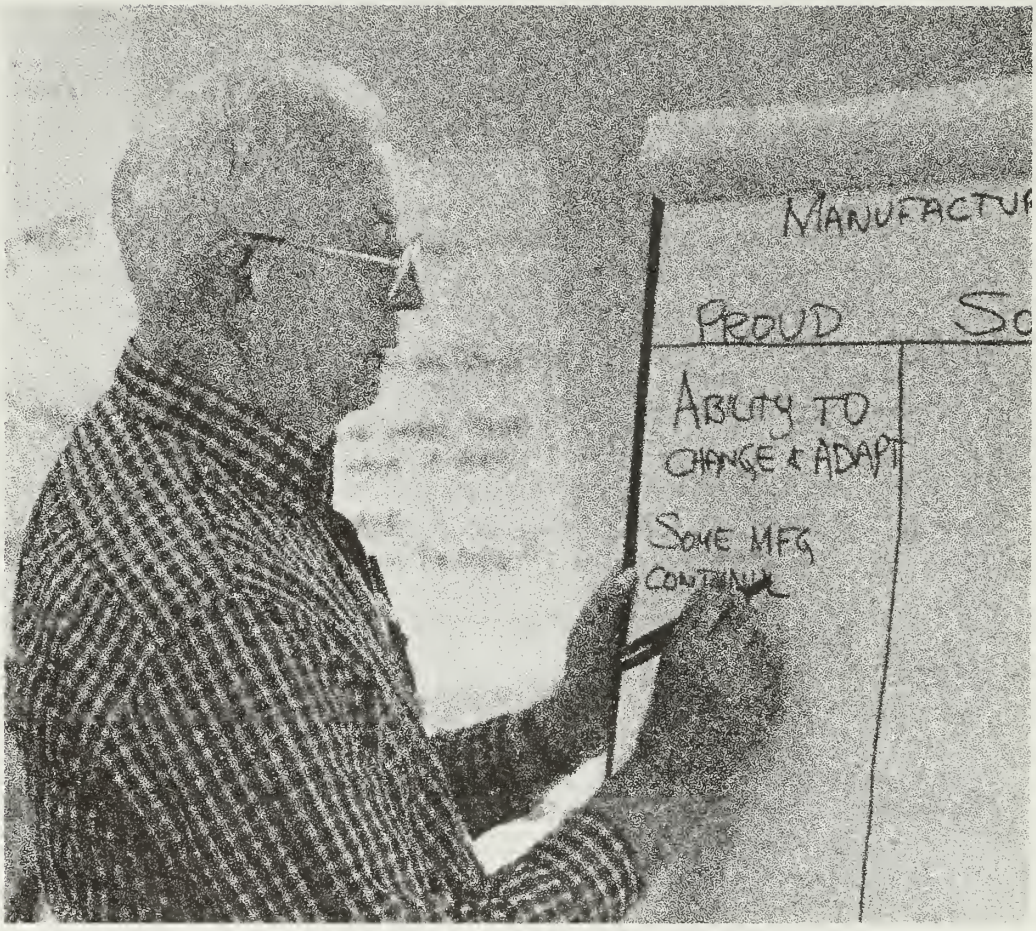
At the same time, we recognize that Massachusetts's workforce is highly educated when compared to that in most other states. Our vocational schools, universities, and colleges have played an important role in producing an educated workforce and in fostering the growth small companies. These two by-products of our educational system should produce real competitive advantages in Massachusetts that we should encourage and exploit.

Society

Diverse events and trends have shaped our society over the last three decades. First, the 1960s gave us a sense that "we can do anything," encouraged by President Kennedy and then President Johnson and his Great Society. We witnessed significant technological advancements, especially through the space program. The Vietnam war had a profound effect on most of us, for a remarkable number of the conference participants that war was one of the most significant social and political events in our lives.

In the 1970s and 1980s, we began to feel change—in the family structure, in the diminishing power of "family values," and in the collapse of our sense of the larger community. The promotion of the individual over the community seemed to result in our feeling less safe personally, in a rise of litigation, in chaos in race relations, and in the growth of an anti-government movement. Our population is aging, and we acknowledge a growing chasm in the 1980s between the rich and the poor. And, we are not clear as to how these issues will be resolved.

An additional task in the analysis of the society sector was to describe the ideal future for the next decade. What our group wants to see happen is an integration of the workforce, an increase in job opportunities, a solution to the health care crisis, more political and personal accountability, and an increase in the application of technology to education and manufacturing. We look to balance economic growth and the use of technology for the general good of society with respect for the earth. At home, we want a national purpose defined and understood by all. And, ultimately, we want peace.


MANUFACTUR
PROUD
ABILITY TO
CHANGE & ADAPT
SOME MFG

III. The Present

For an analysis of our present situation, we moved into stakeholder groups. Manufacturers sat together; educators from universities and community colleges shared a table; government policy makers and service providers met in their respective groups. In these groups of "like-minded individuals," we used the data from our analysis of the past to help us understand the present situation of manufacturing and the factors that shape our responses to the manufacturing economy.

We began by discussing the current news stories that each of us had selected to represent the events or trends that were affecting small and medium-sized manufacturing firms in Massachusetts. Some brought articles about job losses; others told of articles about new successful manufacturing companies, new technologies or new quality programs.

Using these stories, we focused on the trends, events, and developments that are shaping the Massachusetts manufacturing economy right now and that will shape it in the future. We analyzed these trends within each stakeholder group and then presented the most significant to the other groups.

Immediately following these presentations, the whole conference gathered to create a "mind map" of the international forces that are creating the competitive manufacturing climate in Massachusetts. A mind map (ours is featured as the cover of this report) is a visual representation of a collective view about the complex factors that influence a core issue, in this case, manufacturing in Massachusetts. Radiating outward from the core are pathways of related topics and issues, such as competitiveness, quality, cost of health care, environmental concerns, and regulations. These pathways were chosen by the participants and represented their particular concerns as well as those developed in their stakeholder groups.

In less than an hour of brainstorming, the mind map became a dense structure that reflected the constellation of factors and conditions in which manufacturing struggled to remain competitive. Our empathy for the manufacturers increased as we watched this overwhelmingly complex set of conditions grow. We were all struck by the clear image that our existing service programs only touched a fraction of the full picture. Where could manufacturers find the assistance that they needed to achieve success in this complex environment, and how could service providers collaborate to provide a larger, richer number of support services?

The picture was too complex. We could not hope to address all the issues. To sort and identify priorities, each of us, using colored dots that identified our stakeholder group, marked our own priorities and identified key issues and international trends that are having the biggest impact on manufacturing in Massachusetts.

By simply counting the marks, we arrived at a list of what the stakeholders felt the key issues to be. They are

- The high cost of employment (insurance, health care, workers compensation)
- The credit crunch (and lack of investment capital)
- Supplier relationships/quality issues
- Availability of training and education
- Regulatory Issues (costs of doing business)
- Defense cuts
- Lack of a state industrial policy/coherent action to assist business

Each stakeholder group then used this list to identify key themes that their group considered most important. These issues were then reported back to the larger group as priorities that must be addressed in any service system. In rank order, across all the stakeholder groups, the following issues rose to the surface:

1. Education and training
2. The credit crunch (and lack of investment capital)
3. Lack of a state industrial policy/coherent action to assist business
4. Regulatory Issues (costs of doing business)
5. Supplier relationships/quality issues.

What are we doing now about each of these issues? What should we be doing now that will help us deal with them in the future? Discussing these questions from their own organizational perspectives, the stakeholders were remarkably similar in their perceptions of what was currently being done and unanimous in their analysis of what should be accomplished in the future. (Too detailed to present here, these important points are summarized in Appendix B.) In education and training, for example, nearly all the stakeholder groups talked about the need to improve coordination and delivery of education services, to develop linkages between providers and industrial customers, and to develop more accountability within the system. Manufacturers expressed especially strong feelings on the need for better training for the existing workforce as well as for new workers; the depth of their concern cannot be over-stated. In the area of industrial policy, manufacturers called on the state to take the lead in coordinating the fragmented elements of the state system and to more effectively reach out to industry to create partnerships around specific objectives.

In the area of assistance for supplier relations and quality, for example, representatives from business associations called on educators to target educational services to smaller firms and to become partners in the search for higher quality. Manufacturers expressed a need for more collaborative applied research and stated that smaller companies needed to break down some of the traditional methods of doing business and take a more active role in initiating partnerships with government and with each other through networks. Representatives from some of the smaller companies asked for help in meeting supplier certification requirements.

In short, it soon became clear that we all agreed which elements were necessary to improve the performance of industry and of publicly supported services: accountability, coordination, partnerships, and the sharing of information to increase the sophistication of service providers and of users.

Finally, each stakeholder group looked at the present from a second, more internal perspective. Each group was asked to generate a list of "prouds" and "sorries"—a list of the things going on right now within our organizations about which we feel good and about which we feel apologetic. By going through this important exercise, we developed a shared appreciation of present strengths, needs, and hopes, and a mutual "owning up" to mistakes. Moreover, we could publicly state a commitment to do something about them.

Manufacturers (Group One)

Proud: U.S. quality is re-emerging; manufacturing has begun to respond. Manufacturing creates real things: jobs, wealth, products, markets.

Sorry: We waited until a crisis occurred; we had to turn to too many foreign products; we had to eliminate good jobs; we tried to take too much from labor by resorting to temporary workers, reducing benefits, and, stagnating income.

Manufacturers (Group Two)

Proud: We are able to change and adapt; we have a high level of skill and education; we are increasing efficiency and productivity.

Sorry: We failed to recognize the need to change and diversify sooner; we failed to invest in the long-term, which resulted in loss of jobs, technology, market share and confidence. Management-worker relationships are poor.

Educators

Proud: Training programs reflect innovative thought; we satisfy many company training needs; we have begun some coordinated efforts at state-wide planning.

Sorry: We haven't yet found a way to use our programs better; we have not dedicated our resources to our institutions and personnel; we lack coordination between education/training systems and economic development.

Private Service Providers/Business Associations

Proud: We have strong capabilities; we have survived and achieved results.

Sorry: Management is recognizing and admitting to problems, but companies are not working together or sharing solutions; companies are not keeping up with customers needs and with the requirements of world-wide market.

Workforce/Economic Development Agencies

Proud: We have a strong capacity for local/regional development; we have rich resources in this state; we have more private sector players and more input from regional groups for policy.

Sorry: We are reactive instead of proactive; we are behind the curve because we do not anticipate workforce trends and needs; we compete for state turf, and we lack of clarity of priorities.

State and Federal Service Providers

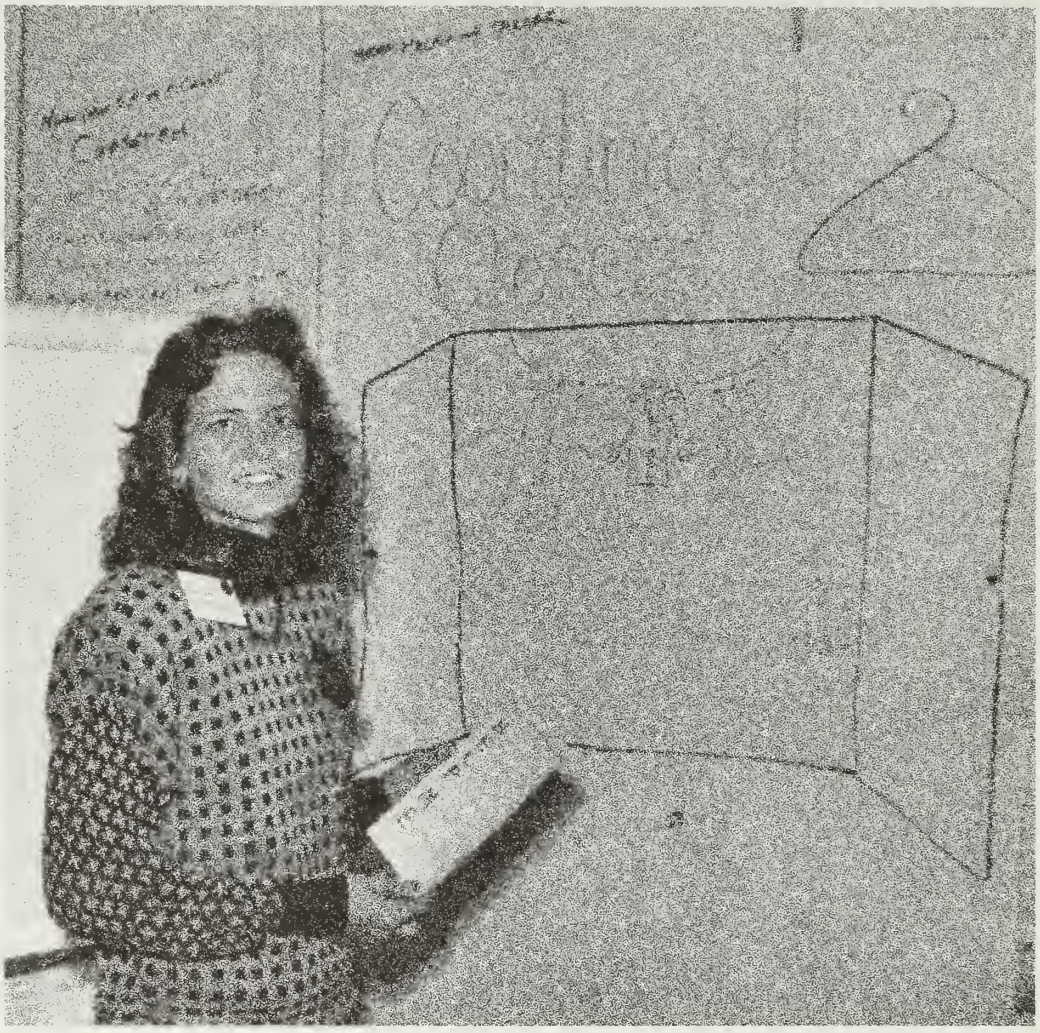
Proud: We have recently developed partnerships with other agencies; we are self-sufficient and have marketable/useful services; we have specialized private sector partnerships.

Sorry: Our newly developed partnerships are not yet a coherent system; we are less risk-oriented and more compliance-oriented (short term); we are not successful in leveraging private partners to influence small business policy.

Government

Proud: Government attitude is changing; we are trying to grapple with the issues.

Sorry: We are too slow to change and too slow to develop leadership.



IV. Future Scenarios for a Massachusetts Manufacturing Extension Service System

As we began to understand the mutuality of our interests in manufacturing and the strength in the sharing of our various perspectives, two key questions emerged. What do we want to see in the future? What are we prepared to do to achieve our future vision for manufacturing? Our conference objectives and the momentum of our efforts were leading of to a creative consensus.

An important but more subtle message also began to emerge—partly due to the effectiveness of the original conference format and partly due to the strong participation and interest of the stakeholders. We began to realize that we would be the people—the decision makers and the customers—who would create a manufacturing service system in Massachusetts. Educators, policy makers, service providers, and manufacturers would build the system for the future. The next question arose quite naturally: Why not begin now?

The final set of conference tasks directed what we had learned on creating a future for manufacturing services and manufacturing growth in Massachusetts. We envisioned a future in which a manufacturing service system played an important part as a link between the economy and government.

Our conference facilitator asked us to design a "seven-minute report, dramatization, or other creative way of communicating our vision of the future." The goal was "to imagine an ideal future for a service system in Massachusetts." Participants were encouraged to see this as "an exercise in creative dreaming . . . include anything from your wish list that is possible, viable, and motivating."

The results were fun. We had a good time developing outlines and portrayals of the future. Each of the seven "mixed" groups produced a clear picture of its ideal future for manufacturing and manufacturing services. Some common refrains began to emerge of what we hoped to see, what we thought was possible, and what we expected of ourselves as manufacturers and as service providers.

Although the scenarios were humorous and entertaining, they produced some very serious revelations. We outlined systems that addressed the key themes that we had collectively identified. We specified funding mechanisms, information systems, and defined ways to build effective partnerships between industry and government. We designed new systems based on our experiences and the knowledge we gained in the conference. In spite of the fun and the hyperbole, the power of the ideas began to emerge: we could, in fact, design a new service system for manufacturing. The previous difficulties in doing so rested not so much on any inherent problems as in our reluctance to let ourselves commit to a future.

Future Scenario No. 1

As part of the National Trade Show 2002, a Cape Cod-based manufacturing company Coordinated Closets (CC), intrigues many trade show attendees. CC owes its rapid growth and success to a state-run service called HELP ME (Helpful Entrepreneurial Liaison for Product and Manufacturing Excellence), a manufacturing partnership network coordinated by the Massachusetts Business Development Center and Worcester Polytechnic Institute.

By dialing 1-800-HELP-ME, CC—makers of programmable modular closets, using flexible manufacturing techniques—receives answers to their questions and solutions for their problems: from setting up a business plan to making a prototype; from selecting a location and building a facility to obtaining funding and training a workforce. One telephone call put CC in touch with the coordinated manufacturing support system that has made Massachusetts extremely attractive as a place to relocate their operations. In fact, an Arkansas-based company, Wash and Wear Closets not only decides to move to Massachusetts but also to form a joint venture with CC.

Future Scenario No. 2

In 1992, an entrepreneur tried to set up a company in Massachusetts to produce a microprocessor that he had developed. He had been overwhelmed with the issues that he had had to deal with and the barriers to resolving those issues that he had had to face. As he explains, his problems ranged from the inability to find educational and technical assistance to set up the company to getting information about regulations, workforce policies, and workforce development. In other words, to succeed, he would have had to set up his own network of professional, educational, and technical support, and because he couldn't, his company closed before it opened. Those who had tried to help had put him on a merry-go-round that he couldn't get off.

Fortunately, for the manufacturing industry, times have changed. By 2002, all an entrepreneur has to do is call WOMEN (World-Oriented Manufacturing Extension Network), a coordinated network of services with easy local/regional access to public and private resources. The business steps to take to become successful are the same, but the process is much different. In one place, manufacturing companies can receive:

- R&D support
- Trade leads with a long-term market view
- One-step application for financing
- Technical assistance for sighting and permitting, which makes obtaining permissions a one-day process

- Access to a public/private partnership for training
- Technical assistance for getting a product to market
- Technical assistance in manufacturing design

Future Scenario No. 3

A press conference is being held in Tokyo as part of the first annual ceremony to honor the winners of the Creating a World-class Manufacturing Environment Award. Massachusetts wins the award, which is accepted by the Governor of Massachusetts, the first governor to be elected from the manufacturing field.

During the question and answer period, the Governor explains that Massachusetts has overcome its reputation as an unfriendly environment for manufacturing companies. He reports that the twenty-five manufacturing networks that operate around the state have helped to increase the percentage of the workforce in manufacturing to 25% and to give Massachusetts the highest percentage of ISO 9000-certified companies of any state in the country. The manufacturing networks are, in turn, supported by a export trading company, a domestic marketing arm, a modernization arm to help the over 1,000 companies keep pace with the international competition, and a group that defines the networks' skills training and retraining needs and then matches each network with the appropriate provider. These networks integrate horizontally as well as vertically.

State tax incentives to banks and insurance have produced a $1 billion pool from which training, environmental regulations, safety, and apprentice programs are supported. The apprenticeship program has worked particularly well, emphasizing vocational technical schools as an extremely viable educational choice and raising manufacturing to a much more respected employment option.

Future Scenario No. 4

The Massachusetts Manufacturing Extension Services Corporation (MMESC) celebrates its tenth anniversary with a special edition of DATELINE. This prime-time news program on WBTV, an interactive-video station owned by the Corporation for Business Television, features gavel-to-gavel coverage of MMESC's board of directors meeting. Open, interactive coverage of these meetings is in its fifth year and has been a major component in making the MMESC network of stakeholders, manufacturing employers, successful because no matter where they are in the state they can actively participate in any board meeting as it is being held.

Created by a special act of the Massachusetts legislature in 1992, the MMESC board has eleven members, eight of whom, by law, are from manufacturing.

MMESC's mandate is to serve the manufacturing industry in Massachusetts by employing technology transfer, training the workforce, discovering financing alternatives, acting as a regulatory clearing house, facilitating collaborations, providing up-to-date labor market information, marketing Massachusetts manufacturing outside the state, and acting as the coordinating broker with other state institutions. The agency can employ, by law, no more than fifty people so that it can never become an ever-expanding bureaucracy. This limitation means that most of the work has to be done by the MMESC partners in industry, higher education (both public and private), state government, financial institutions, K-12 educators, and other regional organizations.

MMESC's goals are to provide services to small and medium-sized firms and to coordinate the many rich resources of the Commonwealth. In the past ten years, the number of small businesses—with 20 to 2,000 employees—has increased, and they have been situated in industry clusters around the Commonwealth; the first such cluster was the Environmental Business Council, organized in 1992. Because of the services provided by MMESC, these small businesses are now computerized and automated; they export from outside the region as well as throughout and outside the United States; they have a competent workforce, supported by continuous workforce development; they invest substantially in R&D (somewhere around 15% of their revenue); they have improved partnerships with their suppliers and customers; they have reliable financing; and, they are profitable.

These businesses have gone from not having a clear business picture even six weeks ahead to a range of a 90% clear view for the next six months to a 25% clear view for the next three years. Understanding their future prospects more clearly has made each of them much more stable and has been a good use of the reliable information and support that they have received from MMESC.

In addition, MMESC has raised the quality of the education received by students K-12 to that received by K-6 students in 1992. MMESC has also improved the skills of the state's diverse workforce. Because of MMESC's efforts, the average worker—who is fifty-five years old—is literate, bilingual, and technically competent (with up to six months in skills training every five years).

Through the interactive hook-up, members of the board who are off-site report the following:

- The first $10-million contract with MIT for technology transfer is a success. MIT has acted as the facilitator for 100 companies to produce 20 new products and to provide 500 new jobs. The next contract is targeted to assist 200 companies.
- Based on the success of MMSEC's first venture capital fund, which has a better than 15% return, the second "Twenty-first Fund No. 2" will close in the next three months. This $200 million fund ($50 million from public pension funds, $50 million from international funds, and $100 from IRA and 401K investments) will be managed by 10 firms throughout the state and will aid the development of between 180 and 200 new companies. This venture is particu-

larly timely because of rapidly developing technology, especially supercomputing software.

- The partnership with Vietnam to set up a fiber optics manufacturing facility in Massachusetts is well underway. Created to support the increasing need for fiber optics communication systems in the Pacific Basin and to compete with Philippines-based companies, this initiative includes Vietnamese language training for the Massachusetts-based sales force by the University of Massachusetts at Lowell.

Future Scenario No. 5

Using the pocket-sized, audio and visual communication network that they have set up to link their collaborative partners, this manufacturing network task force meets to discuss how best to support the growth of a new company that manufactures heat transfer devices (radiators, in 1990s vernacular) as well as enhance the economic development in the region. Reports are given by consultants from each of the stakeholder groups as to the progress that they have made.

Funding issues are settled as they come up. Because of the network's great track record, NIST has committed to donating 25% of the support costs. When asked if the state can comply with NIST's request for a 50% match, the state representative on the task force checks, via his pocket data link, to find that the state can do 25% and that BayBank has promised to do 25%, based on a federal match.

The education and training consultant reports that the response time to meeting a manufacturer's needs for a specifically trained workforce is almost immediate through the collaborative. There is in place what amounts to an education SWAT team that provides off- or on-site, cutting-edge training programs to precisely meet the company's needs. All he has to do is make the request; after doing so, he learns that everything will be in place by next week at a cost of $400 to the company.

Future Scenario 6

Brenda Starr, television talk show moderator, is interviewing the partners who make up the Worcester Regional Manufacturing Assistance Center (WRMAC) team. WRMAC is one of the twenty-five assistance centers in the state-wide network that have given Massachusetts national recognition for having the highest employment rates; being the safest place to live; having the highest skilled workforce; having the strongest tax base that, in turn, supports the best system of social services; and producing the most high value added products. Because of this network, Massachusetts is also known internationally as the place

to learn strategies for producing high value added products.

During the interview, WRMAC's state policy coordinator reports that the state policy board has contributed to the network's success by providing support to small and medium-sized companies that have highly skilled workers who produce high-value-added products. The board also evaluates investment opportunities and provides the budget to create solutions. Because all participants in the collaborative effort are locally based, the needs of the biotechnology and manufacturing industries on which their energies were targeted are well understood and well met.

The finance director explains that because of the surplus of monies available to the center the partners are able to do everything that they wanted to do, including providing seed capital for small businesses. He speaks with pride of their employee development and technology update programs, and as he states, the ongoing success of manufacturing in their region is due in part to the active participation of the local board members who meet monthly to keep up with the demand for their services.

WRMAC's director of programs then explains that he has come to his present position from manufacturing through the state's eight-year Masters in Manufacturing Innovation program where he spent two years each studying finance, education, technology, and employee training. As director of programs, he provides ready access to the center's clients to a team of experts in each of these four fields.

As an example of the process through which he serves a manufacturer, he describes MechTech, an apprenticeship program that provides machining trainees with 8,000 hours in four years of skills training, an associate degree in machining, and access to all facets of the manufacturing industry. Unique to this program is the four-month rotation element that puts apprentices into a variety of manufacturing companies. The program prepares its participants to become machinists, floor managers, supervisors, and eventually, owners.

Moderator Starr concludes by describing WRMAC as a one-stop shopping center where a manufacturing company can receive team-coordinated assistance in technology, training, or work organization. The CEO of DSE (Disgustingly Successful Enterprises) affirms Starr's description by praising the comprehensive computer network that the Center provides for her. With it, she has on-line access to all of the regional centers to answer any question and to keep her up-to-date on new ideas and best practices. This convenient, efficient service allows her company to remain flexible enough to meet the ever-changing demands of the marketplace.

Future Scenario No. 7

Massachusetts's new manufacturing network is described to an out-of-state manufacturer who is thinking about moving his company to Massachusetts. When asked how the state has gained its reputation as being "manufacturing friendly," the governor-elect tells the prospective settler that the state government is totally service-oriented. By calling 1-800-NET-WORK, a manufacturer can have any question about any aspect of manufacturing—from regulations to training programs—answered in one or, at the most, two calls because the caller is linked to the state's vast network of manufacturing support resources.

This "one-stop shopping" for assistance—made up of state-wide governmental and educational resources connected by the computer network—gives a manufacturer ready access to concrete information about everything from tax incentives to export/import regulations and assistance, from customized retraining programs to literacy support. An ombudsman familiar with the manufacturing industry sits at the center of the process, ensuring that all manufacturers' problems will be addressed.

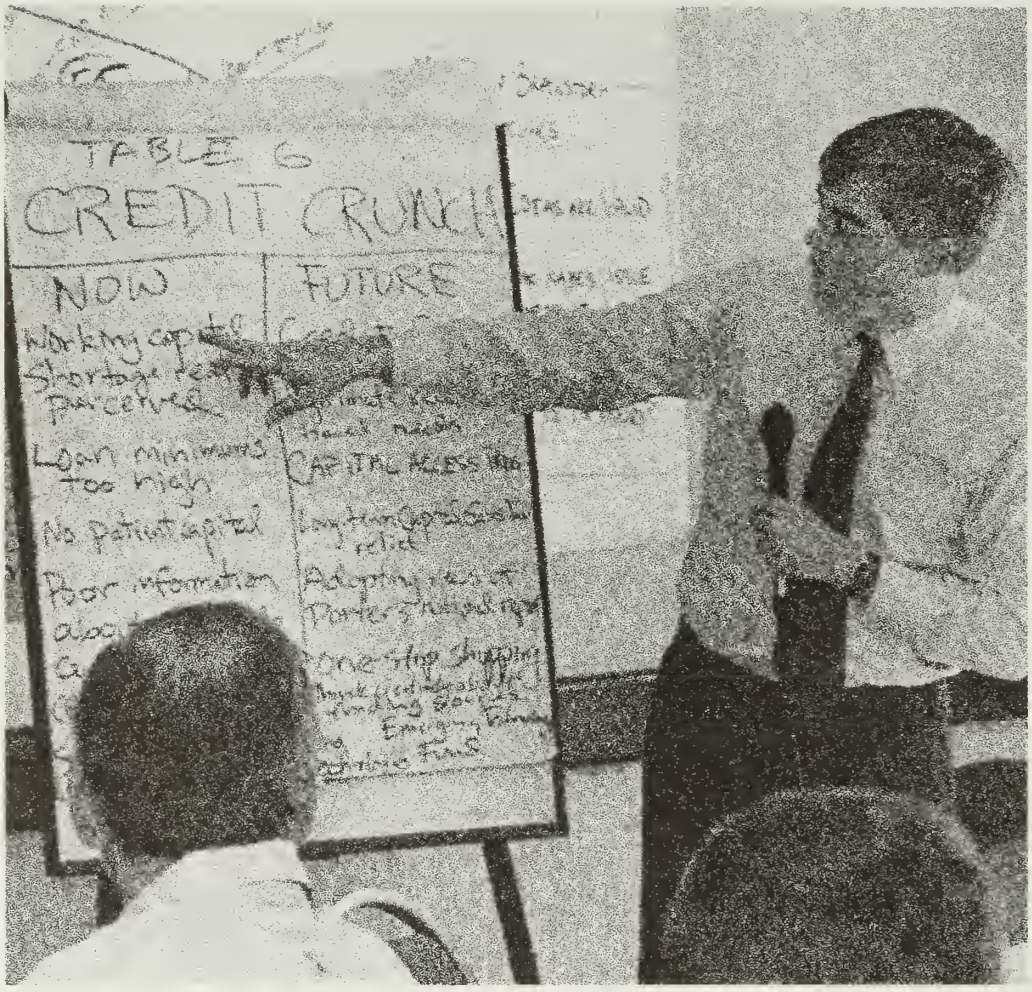


TABLE 6
CREDIT CRUNCH
NOW
FUTURE
Working cap
Shortage
Perceive
Loan minimums
too high
No patient capital
Poor information
CAPITAL MASS
relief
Adopting
Porter
One-stop
Energy

V. An Outline for a Manufacturing Service System

After we presented the future scenarios, volunteers and the conference facilitator put together a list of the common themes among the groups' future projections. Drawing on the data in the scenarios, we identified the elements that should become the building blocks of a manufacturing extension service system. The task was surprisingly easy because the scenarios each contained remarkably similar elements. By thinking creatively and working together to describe an ideal future, we had rapidly outlined a consensual view of the future for manufacturing and the role of a manufacturing extension service system.

POLICY DECISIONS AND PRINCIPLES

- State leadership needs to develop an industrial policy.
- The state needs to commit to forming an extension service system.
- The customers of such a system are small and medium-sized manufacturers.
- Industry driven/focused leadership and partnerships are needed.
- The leadership of the system has to focus on industry needs and be part of the partnership between industry and government..
- Multiple sector partnerships—made up of government, industry, education, and public sector groups—are necessary.
- Service providers must be able to rely on stable funding to develop a long-term, coordinated system.

MAJOR TASKS AND ADVOCACY ISSUES

- A world-class system is a major goal.
- The manufacturing base needs to be stronger and bigger.
- Manufacturers need access to real money, including:
  - a venture capital pool
  - company-to-company joint ventures
  - tax incentives
  - changes in the incentive system to reward collaboration among service providers and companies.
- A continually evolving, flexible vision or strategy is best.
- The education system needs to be enhanced to provide appropriate workforce skills training and the continuous upgrading of programs.
- Apprenticeship programs are needed.
- The economic environment needs to focus on nurturing manufacturing and people in manufacturing.

ORGANIZING DIRECTIVES

- The system should offer a regional delivery mechanism but be organized state-wide. [This discussion led to the idea that to recognize regional economies and the diversity of their contributions to the state economy there should be both regional and state-wide system.]
- A one-stop manufacturing resource center is needed.
- A quick, easy reference system is important; one call to the center(s) should be all the contact that is needed to access information from the rest of the system.
- The network approach to providing services has to include companies networking with each other as an integral part of the system.
- A computer infrastructure is needed to maintain the system's flexibility and to provide access to information in a use-friendly, efficient, and timely fashion.

MANUFACTURING SERVICES TO BE PROVIDED

Least controversial were the specification of services that an extension services should provide or coordinate. All parties agreed that the systems should first coordinate existing services, then evaluate the services based on goals and outcomes. New services should be added in response to industry demand and after the identification of gaps in existing services.

- Qualified, experienced staff as agents or brokers who represent manufacturing interests
- Funding assistance
- Business strategy and planning assistance
- Applied research
- Technical assistance
- Workforce training
- Training for private and government employed technical assistance providers
- Global market information
- Regulatory assistance
- Quality/benchmarking information
- A team approach to providing services

QUESTIONS STILL TO BE ADDRESSED

Each of the following questions appeared in at least one but not all of the future scenarios.

- Should we target specific industries?
- Should services be brokered or come from partnerships with the companies?
- Should we use a locally driven or top-down approach?
- Should we include pilot projects with real companies?
- Should we provide workforce diversity training?
- Should we have private/public sector exchange for providers so that each could move into the other's sphere in order to learn how to operate there?

VI. Action Planning

Our final task was to make commitments for action, both as stakeholders and as decision makers. Meeting for the final time within our stakeholder groups, we examined the outline for the design of the system and asked ourselves what we could contribute toward making the design a reality. Each group addressed two considerations: short-term initial steps and long-term implementation. The goal, set out at the beginning of the conference and again during the presentation of our future scenarios was to establish an effective manufacturing service system.

Business Associations and Private Service Providers

SHORT-TERM ACTION STEPS:

- Regroup and critique a draft of the conference report or the final report. [Associated Industries of Massachusetts offered to sponsor a conference reunion to implement this action item.]
- Support the development of a final plan of action.
- Communicate the conference initiative to respective stakeholders, shareholders, colleagues, and associates.
- Commit to ongoing participation in the implementation of the conference initiative and identify specific projects in which they can become involved.

LONG-TERM ACTION STEPS (OVER THE NEXT THREE YEARS):

- Evaluate, support, maintain, own, nurture, and protect a manufacturing extension service.
- Increase their own involvement in these activities as well as that of their associates.
- Ask the Massachusetts congressional delegation to push for federal funding to support and expand the manufacturing extension service.
- Establish annual performance criteria so that government agencies, companies, and public will know what the end results and future needs are.

Economic and Workforce Development Service Providers

SHORT-TERM ACTION STEPS:

- Support the growth of their collaboration with the Massachusetts Alliance for Economic Development—a new entity that has been formed by the utilities, telephone, and railroad companies to support the growth of their industrial customers—and the Massachusetts Economic Development Council, an

association of local and regional economic professionals.
- Interface with the Commonwealth's Economic Affairs Office, particularly in support of the state economic strategies that will be coming out in the near future.
- Evaluate the individual services that already exist and how well they match the needs of their customers and constituents.
- Communicate the conference results to all program and agency levels with which they work.
- Collaborate on efforts to create regional economic development alliances in order to take advantage of the federal monies that will soon be available.

LONG-TERM ACTION STEPS:
- Develop pilot projects for manufacturing service networks.
- Participate regularly in formalized linkages with economic development groups.
- Develop a resource center, using existing service providers, that will be part of a state-wide system that would be independently funded and would provide a variety of electronically accessible information databases.
- Streamline and coordinate the services provided by their stakeholders.
- Formalize a regional delivery service.

State and Federal Service Providers

SHORT-TERM ACTION STEPS:
- Define the baseline inventory of actors, services, and resources.
- Get help from quasi-publics, state agencies (MOBD), industry associations (AIM, SBANE, MACE, NFIB), higher education/vocational education institutions, and regional and local groups.
- Develop a plan for training front-line service coordinators.
- Recommend a governance structure for statewide implementation.

LONG-TERM ACTION STEPS:
- Develop a dynamic inventory of available services and resources.
- Develop a well-trained, front-line capacity to guide customers to services and resources.
- Identify and document the gaps and duplications in the existing services and resources.

Educators

SHORT-TERM ACTION STEPS:

- Participate in an ongoing planning process that includes the stakeholder groups represented in the room [also listed as a long-term commitment].
- Communicates to their own constituent groups the consensus that has resulted from the conference.
- Develop links to other education stakeholders that were not present, particularly those from vocational education.
- Convene meetings among education constituent groups to further develop and define education's role in providing services to manufacturing, including setting its own house right with particular attention being paid to the way field work is conducted.
- Begin to assess existing services and resources available through higher education [also listed as a long-term commitment]. As an example, special note was made of larger, NSC grant recently awarded to the University of Massachusetts at Amherst to work on the integration of platforms of international databases.

LONG-TERM ACTION STEPS:

- Develop a dynamic, comprehensive database (to be updated constantly and integrated with other databases) of all education services/programs/courses available.
- Develop ongoing pilot programs, including faculty and industrial development, with business and industry through industrial extension services.
- Develop further industry and education partnerships.
- Develop an integrated, turf-neutral education system to serve manufacturers.

Manufacturers

SHORT-TERM ACTION STEPS:

- Obtain the written results of the conference.
- Stay involved; the whole group was committed to seeing that the conference action items were furthered.
- Disseminate the results of the conference to their local networks and personal contacts.
- Maintain contacts that they have established at the conference.
- Support each other as they continue to explore the implementation of the conference vision.
- Get larger companies to share their experience and resources. Get assistance and dedication to the conference vision from other management sources.

- Enlist help from existing networks, in particular the Berkshire Plastics Network.
- Provide input and guidance from industry leaders in western Massachusetts, as well as provide information to them about the conference.
- Contact other business associates with the results and mission of the conference and enlist their help in promoting political support for the effort.

LONG-TERM ACTION STEPS:

- Establish strong local networks and bring in help from existing organizations.
- Continue to define and establish local area networks, focusing on developing collaborative efforts, such as one-stop shopping, development of government policy, and education of public to "needs" jobs.
- Create a multi-faceted network.
- Continue to provide resources that existing networks and companies have to offer.
- Continue to perpetuate the concepts, ideas, and mission of the conference.
- Participate in the development of technical training to manufacturers.
- Promote apprenticeship training.

Government and Policy Makers

SHORT-TERM ACTION STEPS:

- Bring together public agencies that provide services to small and medium-sized manufacturing firms to define resources and make a commitment to the conference vision.
- Work with Governor Weld to set forth an overall vision of the state's desired economic future and his role in making it happen, including benchmarks to judge performance and a recognition of the importance of all types of manufacturing.
- Fight for legislation that would create programs that support an "extension service"; for example, a Massachusetts Development Association with one-stop shopping, capital access fund, capital gains tax decrease, emerging technologies fund, export fund.

LONG-TERM ACTION STEPS:

- Change the focus of their efforts to meet the needs of the customer, not the needs of the bureaucracy; this change will be led by Governor Weld and assisted by state agencies.
- Recognize the direct economic impact that the Governor's and agencies' decisions and non-decisions have.
- Create a communication network between government agencies, including higher education organizations.
- Monitor benchmarks and performance constantly.

VII. Conclusions

Learning from others and sharing common hopes is an emotional and rewarding experience. Summarizing the learning from "Manufacturing and Massachusetts 2002," sustaining the intensity of three days' work is not easy. The data that we generated, although methodologically validated by our experience, is not easily presented in tabular formats. A considerable amount of the impact of the conference—the energy generated and the commitment expressed—surpassed what can be conveyed.

As the descriptions of tasks and the listing of the actions steps suggest, we learned from each other. As a result, we collectively produced the outline of a workable plan for a coordinated manufacturing service system. Crucial boxes need to be filled in, and the questions of resource commitment need to be answered. These two points were beyond our capacity and not really our intent over the three days.

"Manufacturing and Massachusetts 2002" was designed to lead us to some outcome but not a predetermined outcome. Our intent was to mobilize people who were invested in elements of the public and private service systems and owners and key managers of manufacturing firms. We at Bay State Skills Corporation's Center for Applied Technology and Tufts Manufacturing Resource Center had no other agenda. Participants came with the express purpose of spending three days in planning; that stakeholders committed to three days is in itself a measure of the importance of the issue.

A strategic futures search was a new experience for many of us. However, the outcomes exceeded our hopes, and in some ways, our achievements surprised many participants. The messages that we heard and created were remarkably clear.

Manufacturers and private sector representatives made up over one third of the number in attendance and spoke eloquently of the demand and need for a publicly organized manufacturing service system. This message was possibly the most valuable part of the conference. A second theme, again coming from industry, was their willingness to get involved in this effort, to help lead it, and to be more aggressive in developing partnerships with government. As one participant said later, "We must enter into a new partnership. This conference helped make that clear."

Manufacturers also stated, in very positive voices, their need for government services in areas of training, technical assistance, information, and organizational assistance. In particular, they are concerned about the quality of the workforce and about their ability to compete in changing markets.

This voice is a relatively new one for small and medium-sized manufacturing firm owners and managers. Government and service providers should listen and enter into a dialogue with them to develop a response and further articulate their message.

At the conference, policy makers and service providers took the opportunity to state their clear interest in developing a service system that responds to the needs of these manufacturing firms. Leaders of agencies expressed a commitment to push the traditional boundaries of their services and to take steps, many already underway, to develop coordinated services that really are useful for smaller firms.

Although the future scenarios that we produced were fun to create and often humorous to watch, they each contained a powerful message. Despite the reluctance of industry and government to collaborate in the past, these scenarios demonstrated that together we can build a manufacturing service plan. In just a few minutes of planning and an even shorter rehearsal time, the groups presented coherent service delivery systems, mechanisms for interaction between industry and government, and a set of performance outcomes. Many of these services are available now, others are in the planning stages; still others will come later as we successfully implement the system top which we are committed. We learned in our three days together that our collaboration and a Massachusetts manufacturing extension service system are possible and desirable.

Finally, all of us got a rare opportunity to express a sense of collective optimism about the future. Our expression took the form of a commitment to follow through and form, in the words of our luncheon speaker Senator John Kerry, an "alliance for manufacturing" in Massachusetts. Our commitments are not made in narrow self interest. Underlying our strong hope that manufacturing will prosper again in Massachusetts are our interests in opportunities for rewarding, quality employment; for individual opportunities that can and will develop in a high-wage, high-skill economy; for opportunities to tap the talents of our workforce; and for opportunities to engage our human capacity for making things better.

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Appendix C. Issues Currently Facing Manufacturing and Responses from Stakeholders

This table summarizes the issues affecting manufacturing that each stakeholder group identified as most important. "Present Situation" is the current perception of action needed. "Desired Response" gives an indication of what stakeholders believe should be done. This table provides important, specific information for developing concrete implementation and program services through a manufacturing extension service.

Economic and Workforce Development Service Providers

Issue	Present Situation	Desired Response
Education and Training	TQM/ISO-9000 training needed now. Vocational education is underutilized for new workers, and there is not enough existing worker skills training. Regional Employment Boards (REB) are pushed by federal regulations and unused by business. $600 million dedicated to training in the state; where does it go? K-12 system lack basic skills emphasis.	Coordinate training and resources. Build better linkage between service providers and industry through industry-driven programs. Strengthen the linkages between REB/economic development/industry. Use training money wisely; require demonstration of basic competencies.
Credit Crunch	Banking system is too centralized. There is a lack of financial technical assistance for smaller firms and a lack of risk capital for manufacturing investment.	Introduce more competition in banking. Provide focused support from public/private sources. Expand technical assistance for putting together loan packages. Implement tax credits for job creation.

Industrial Policy	Fragmentation between federal/state/local/service providers. Support for manufacturing in the state is too limited. State shows low policy priority for industry and jobs. We lack a cohesive defense conversion policy. Current "Porter Industrial Policy" is irrelevant to many areas of the state. Good programs are too small.	Improve coordination between agencies with centralized state leadership. Manufacturing should become a priority in the state. The state needs a pro-business political policy. Develop a strategy that will leverage state/federal funding. Expand industrial policy to a broader industrial base. Expand effective programs.

State and Federal Policy Makers

Issue	Present Situation	Desired Response
High Employment Costs/Over Regulation	The relationship between government and industry is too adversarial. Government programs are too categorical. State and federal permitting process is confusing.	Government and industry should integrate their efforts. Find synergies through aiming for multi-media permitting. Government agencies work together to develop "one-stop shopping" assistance for industry.
Training and Education	Training is too categorical. There is too much "turf" in education, while there is little industry input. Curricula is driven by bureaucracy rather than needs of the economy. K-12 teachers and vocational education. are undervalued and undertrained for new technologies.	Define market-driven programs. Update curricula. Create consensus on standards that meet industry needs.
Credit Crunch	Working capital crunch is real. Loan minimums and financing costs in public programs are too high. There is no patient capital. The information is poor about available capital programs. There are financing gaps for emerging industries/ technologies.	Credit should be more available for legitimate receivables. Create capital access program. Implement banking reform. Long-term capital gains tax relief is needed. Venture capital available for manufacturing. One-stop shopping and creative thinking about funding sources for "emerging technology" should be created.

Business Associations and Private Service Providers

Issue	Present Situation	Desired Response
Supplier Relations and Quality Issues	Companies are trying to get close to their customers through benchmarking operations, JIT, ISO-9000, qualifications, and supplier certification. The steps are very difficult and confusing now.	Need a higher education level for small firms. Increase education on quality and flexibility. Assisting companies in getting a product out must be priority for manufacturing education and assistance programs. Federal government support is necessary.
Costs of Manufacturing	Contradictory regulations.	Implement periodic review of regulations. Redefine regulations so that they support performance outcomes vs. command and control.
Training and Education	People do not have basic skills. Management is resistant to workplace training. The workforce needs skills, literacy, and workplace upgrade training.	We need education reform. Skills and upgrade training should be available in workplaces for both managers and workers.

State and Federal Service Providers

Issue	Present Situation	Desired Response
Credit Crunch	De-regulated banks now overly cautious. Tax policy discourages manufacturing. No GAT financing at state and local level available.	Create incentives for private capital formation with focus on small and medium-sized, high value-added firms. Reduce transaction cost of doing business. Create more incentives for start-ups. Need certain GAT financing programs.
Education and Training	Need for K-12 reform is apparent. Cost of higher education is too much for many workers. Workforce training resources are too categorical. Business needs are not woven into current programs.	Reform educational to improve outcomes and justify increased financing. Increase tuition assistance for workforce training in higher education. Increase private-public partnerships. Make training more accessible and relevant.

No Industrial Policy	Defense spending has spurred technology; potential is to create new commercial markets. Foreign competitors have had more explicit industrial policy. Need to improve operations in commercial markets. Regulation is not responsive to business conditions. State has no industrial policy for small and medium-sized firms.	Need more state and federal partnerships on industrial policy. Define industrial policy for small and medium-sized firms. Help focus smaller firms in private sector on priority markets (need federal coordination). Regulations should be more responsive to business conditions.

Educators

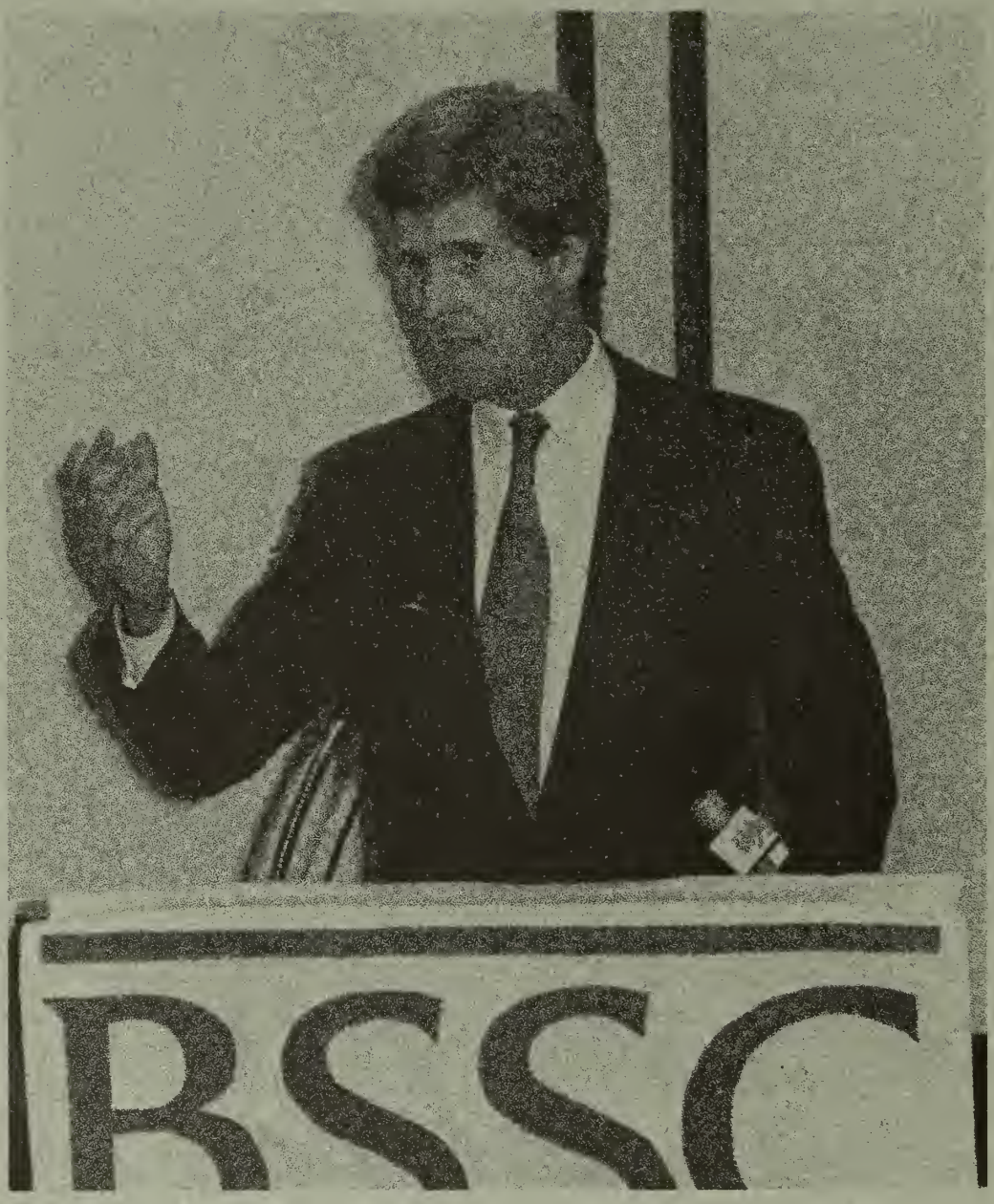
Issue	Present Situation	Desired Response
Education and Training	Education and training are fragmented, embryonic, underfunded, unfocussed, uncoordinated, reactive. We pay more attention to college-bound kids than to non-college students. Federal funds are not easily accessible.	Education and training should be coordinated and proactive toward the economy. We need strategic planning for K-12 and higher education. Increase participatory planning around business needs. Provide sufficient funds for K-12, vocational education, and higher education with flexible access for the workforce.
No Industrial Policy	We don't have industrial policy within the state. Education has not been a part of any industrial policy discussion.	Create a dynamic state and federal policy in which training and education play a key role.
Credit Crunch	No capital for new techniques and ideas, no capital for start-ups, companies do not have access to training money when they most need it.	Simplified system of loaning training money to companies. Assist companies in financial restructuring and include training funds so that when firms are down-sized, people who have been let go can move into new jobs more quickly. Establish funds for incubator capital and start-up funds.

Manufacturers (Group 1)

Issue	Present Situation	Desired Response
No Industrial Policy	Adversarial relationship between government and industry because of last ten years. Laws are based on revenue impact and needs of population, but fairness does not apply enough to businesses. Government is too reactionary and has a lack of interest or understanding of business requirements. Business depends too much on isolated lobbying efforts to try and move things.	Need more collaboration, planning, and partnerships. Should develop better cost benefit analysis of laws (productivity, jobs competition). Policy formation needs increased involvement of industry in education planning and directing funding. Lobbying efforts need to be more comprehensive around a policy.
Supplier Relations/ Quality Issues	Small firms are caught in adversarial relationships between suppliers and customers and bankers and labor and government. Time pressures create a short-term focus. Need more information/assistance on JIT, ISO-9000, costing methods.	Promote more collaboration between companies on research and shared data. Focus on the long-term through partnerships and networks. Incorporate JIT, ISO-9000. Replace traditional costing with costing that reflects total quality programs. Involve/empower employees.
High Employment Costs	Shifting costs of employee benefits: lowering benefits, using temporary workers may not work in the long run. High costs: litigation, benefits, workers compensation. Companies leave state to avoid costs.	Better manage health programs. Expanded funding base for social costs (through VAT). Manage safety programs. Use legal reform to lower costs of workers compensation.

Manufacturers (Group 2)

Issue	Present Situation	Desired Response
Supplier Relations/ Quality Issues	No clear definition of quality, each vendor has a different standard, slow ISO-9000 implementation (high cost). Customers demand too high levels of performance. Many changes cannot be avoided any longer. In process inspection is happening.	Define a consistent quality standard and offer implementation assistance for smaller firms. Companies need ISO-9000 and other guidance from the state. Provide training in realistic benchmarking.
No Industrial Policy	Small companies cannot get money because of lack of state interest in manufacturing. Similar with high employment costs: health care, workmen's compensation, licensing, energy costs. NAFTA will mean more jobs leaving the country which hurt those that stay.	Establish policy priorities that force lending institutions to do their job of lending money to support economic growth. Provide state incentives to keep small businesses growing in the state: tax incentives (investment tax credit). Eliminate fraudulent claims in workers compensation. Promote "Made in USA."
Training and Education	Training is inconsistently provided. Technical skills training is not rewarded, e.g. vocational education systems have been abandoned. Firms can use their own money for training, but costs for smaller firms are too high. There are few modern apprenticeship programs.	Develop and fund career-level technical training based on European model (government/ industry/education) and 2+2 model. Curriculum needs to reflect the marketplace and involve industry and labor in the design. Reinstate apprenticeship programs. Education should be more business and technology related.



Appendix D. U.S. Senator John Kerry's Address to the Participants

December 6, 1992

I'm delighted to be here at this gathering and glad to join you to talk about what is really at the center of this country's activities and what ought to be the primary focus of all of our political energy and effort. Despite the high visibility of issues like the POW/MIA issue, my principle effort is how we're going to put Americans back to work. There is no greater priority for us.

It seems simplistic sometimes, but there is a real connection between the revenues that we generate from the jobs we create and our capacity to do anything and everything else that we want to do. Those of us who care about a high-quality education system, or cleaning up the environment, or drug abuse rehabilitation, or adequate numbers of police on the streets understand that if Americans aren't working and we don't have an adequate tax base, then we are going to be sorely pressed to deal with these crucial issues.

The real issue that this country faces today is: Where are Americans going to work? But, you really have to break that down into two questions: What are they going to make? and How are they going to make it? These are the two real issues.

I'm fairly optimistic that there is an untapped arena, many arenas if you will, that could provide a wealth of potential jobs; however, we'll have to get smarter in this country about directing our research efforts and our energy towards development of these arenas and these jobs. We cannot, I submit respectfully, just leave this to the marketplace to take care of. Why? Not because the marketplace can't take care of it but because the marketplace is not, as we all know, a laissez-faire marketplace.

Look at what Japan and Germany and other countries are doing. They are extraordinarily aggressive in creating ventures between the private sector and the public sector in order to grab market share. Here in the U.S., we've had a bunch of cold warriors in Washington for the last twelve years whose vision has really been non-existent or myopic at best, whose sense of the world is that somehow we can go on being who we have been by virtue of just repeating what got us to where we are. It doesn't work that way.

You can't talk out of one side of your mouth about the new world marketplace and then out of the other pretend that that new world marketplace hasn't changed the rules. It has, unalterably.

I'll give you a vivid example. Al Gore and I were down in Rio at the Earth Summit. He and I share a sense of the possibilities, among many, available in the environmental technology arena. Thirty-five American companies were formally accredited to this conference—companies looking for business, marketing themselves to the rest of the 170 or so nations that were invited. Half of them, I might

say proudly, were from here in Massachusetts. We were well represented.

By contrast, Japan had 700 companies formally accredited to the conference. They are committed in a very significant way to the notion that as the world confronts the resource allocation problem—use of energy, the diminishing capacity to continue using the same industrial habits that we've used to date—there's a new marketplace with new jobs for their people if they remain aggressively committed. And they are.

Look at clean air standards. We have delayed, thanks to Dan Quayle and the Competitiveness Council, and we've missed twelve different deadlines to implement clean air bills. Germany and Japan, on the other hand, have raised the standards of clean air adherence and accountability with the result that their companies have been forced to meet the higher standards, which, in turn, means that they have done the research and have developed the state-of-the-art technology and equipment. Consequently, Thailand, Poland, and Czechoslovakia, among others, are now turning to Germany and Japan to buy their state-of-the-art equipment. German and Japanese workers and their service providers will be the ones providing the technical assistance as well as manufacturing the equipment in the first place. We lose.

We were the world's leader in those technologies. Ten years ago, we were also the world's leaders in photovoltaics, in alternatives, and in renewals. We can be again.

We developed magnetic levitation at MIT. The Germans and Japanese took it and put it into the prototype stage. Now, the same MIT people who developed it fifteen years ago have sort of refined its capacity. Last year, we won a critical battle—working with Frank Lautenberg, Pat Moynihan, and others—to hold on to the funding for magnetic levitation and to increase its status as a priority. I think that with this effort we may have really turned the corner in terms of the possibilities for magnetic levitation; we're now the leading contender in our own country for its future use.

These examples are just a few of those showing the difference between our approach and everybody else's approach. Why we're operating on the ostrich theory—which means put your head in the sand, ignore the rest of the world, and somehow the problems go away—is beyond me. We need aggressive leadership that wants to step out in front on these kinds of initiatives like the manufacturing extension service system, which is a central part of the larger mosaic.

Now you folks have been at this since yesterday, and I'm sure you're well beyond me in developing some of the paradigms by which we'll be able to guide this process, but clearly the possibilities are enormous and the realities are there.

Last year, we spent something like $18 million—that we managed to just eke out of the National Science Foundation, the National Institute of Standards and Technology (that we had to push to get created), and DARPA—to shift the focus to the manufacturing extension concept. But our $18 million is paltry compared to the $500 million that Japan spends in the same endeavor with literally thou-

sands of people out in the field working with companies on literally millions of cases for literally tens of thousands of different companies. What is the matter with us?

When I was over at MIT recently talking with the folks who are putting together the manufacturing institute over there, the gulf between our university research and our capacity to get that research out into the marketplace became patently clear. Look at the difference between our manufacturing techniques and other people's. Because companies in other countries tend to be the instigators and the implementers of the research. So there is a direct connection between the corporate entity's participation at the incipient stage of product development and its participation at the ultimate stage—when the product reaches the marketplace.

Here, on the other hand, we have this great gulf between the university doing something without any real notion of what's happening in the marketplace or what's happening out in the marketplace for a particular company. We don't always have a real capacity to connect the two stages, to move things proactively from the university into the marketplace or even to interchange ideas.

The classic example of this type of connection is Sony. One day, the president of Sony—just to give you an example of how things work in some places and how they have managed to get a bit ahead of us—was walking through a research division of the company where some people were working on a small tape recorder. On the same day, he happened to walk through a totally different research division where they were working on miniature earphones, and he said, "Gee, have you people talked to the people over here?" [the other small tape recorder division] They said, "No, what are they doing?" The two divisions got together, and now, as you know, Sony Walkmen are literally all over the world; everybody's got one.This is the way it works. It's a tiny example, and it may be somewhat trite to some people, but I think it's real. If you're not talking to each other, if you're not aware of what others are doing or what the other possibilities are, and if you're not pushing the envelope of technology, research, and possibility, then you often won't see the light bulb go on at the same time. The key is, obviously, to get that light bulb to go on early, bright, and shining and then move out into the marketplace.

Now, there are lots of possibilities, folks. America is not going to stay rich and a whole new generation of Americans is not going to get rich or improve its standard of living by going back to what we did before—making clothing, shoes, paper products, printing. We'd survive, maybe, with some new technology, but the real broad expansion in the economy, the place we're going to look for real growth as well as an increase in the standard of living— or so I am told by people smarter than I—is in the production of high-value-added products. We are not going to be able to compete low tech with Singapore and Vietnam, which should ultimately come on line. And China, the largest country in the world with 70 million people waiting to go to work, is racing into the modern world; it has a 10% annual growth rate, the fastest growing economy in the world today. This

situation is quite extraordinary, and we cannot compete with the wages that these countries will pay if we're going to stay an open marketplace. Our strength is our great power and our capacity to push the technology, to develop it to create those high-value-added products that we can sell abroad, products that other countries need and want.

Plus, the world is changing. We've got to think about such issues as sustainable development, resource allocation, and how we can allow, for example, the people of Brazil to develop without ripping apart their raw forests, which has negative implications on biodiversity as well as on global warming.

The situation in Brazil is an example of our new awareness of international linkages, and we've got to push a new way of thinking about producing products that can meet the needs of countries that, for examples, want to have refrigeration but don't want to produce chloro-flouro carbons in the process, or that would like to have modes of personal transportation without worrying about emission control, or that would like to be able to manufacture without dumping the waste water into their rivers, making them dirtier than they were before.

We need to think more, not about end-of-the-pipe but frontline solutions. Let's not wait for the mess to be made and then clean it up but rather create systems and have them in place to prevent the mess in the first place. If we can market those kinds of technologies, there is just a huge marketplace out there for us. Countless nations from Africa to China to Latin America to Eastern Europe and Russia are all waiting to live better lives.

And, finally, we have a lot to deliver to our own citizens in terms of better lives. We have to face the challenges of housing that is dilapidated and an infrastructure that is broken down. We need to build train systems; we need to have a better way of moving people from place to place; we need to deal better with substance abuse education and a whole lot of other difficult issues, all of which can provide jobs.

The question is whether we are going to push the envelope and excite investment in these arenas. Not only do we need a manufacturing extension service, but we also need the investment incentives that will trigger and support the meeting of these challenges at the incipient stage. Other countries are doing this, too. Where the marketplace won't support a particular approach for a certain period of time, we've got to be prepared to help.

We need to have a research and development tax credit. We need targeted capital gains reduction for new investment. There are a whole lot of techniques by which we can excite private capital investors to take risks that they might not otherwise want to take because they don't see a long-term gain, but the government's got to be willing to reward people with the long- term gain if they do take those kinds of risks.

We lost some of that support in 1980s; everybody was spending their money, trading in existing assets, because we made it very exciting for people to assume large amounts of debt—doing nothing to create jobs in this country. We allowed big companies to be split apart and sold off, which is terrific for the brokers, the

lawyers, and the middle people but doesn't do a lot to create jobs in America.

So, the key, here, is to get back to exciting entrepreneurism, to really remembering what made this country great in the first place, and I think all of the ingredients are available. Those ingredients are all here in this room, which is what is exciting about this conference, and I mean that. Being here is the most important thing that I've had this week or in several weeks, as far as I'm concerned, because we can come up with a model for how we are going to make those jobs and how we are going to improve the manufacture of those products. Remember, computer-based manufacturing design and the computer-based manufacturing process began right here in Massachusetts. We know how to do this stuff, and we ought to be able to become the premier marketers of these and other new technologies internationally.

This initiative is going to burgeon. For example, environmental technology is a $200-billion business today, and we expect that it will be about a $300-billion business in the next ten years. Today, it provides 35,000 jobs in some 1,300 companies in Massachusetts alone, and we expect that the number of jobs will go upwards of 70,000 over the course of the next 3-4 years.

And environmental technology is just one field, one area of possibility; we also have microelectronics, artificial intelligence, robotics, biotechnology, and advanced materials. Think about it. We've got to learn how to build things, to do things, using composites and new materials, that don't require such things as cutting wood and taking our forests apart. This is our challenge of the future.

Today, we have 16% of our people in manufacturing; Japan and Germany both have more than 30% of their people in manufacturing. Those figures tell the story. We can't just be a service-based nation. There's a limit to how many McDonald's, Burger King, Wendy's, and Pizza Hut franchises we can build in this country. Most economists tell me that we desperately need to make some things to drive the rest of the service economy.

Some people try to make the argument that because the economy is now so much more worldwide we are not as dependent as we once were on our own base because we can provide services for an awful lot of other people. I don't buy into that completely. I think we've really got to maintain certain segments of our manufacturing base because they are essential to driving our economy. Plus, we don't want to be dependent on everybody else's manufacturing. There are certain inherent dangers in that.

So, this effort that you're engaged in here is terribly important. I don't think anybody has yet exhausted the thinking about what the real design of the manufacturing extension service center system should be. It's new; we're playing with it. We know that we want to get information to companies; we know that we want to accelerate the research linkage; we know that we want to push the envelope in the design of technology, but we don't, yet, really know how all of that works. So, in the course of your three-day effort by government people, business consultants, educators, and others, I hope that you'll be able to give this concept a lot more definition.

And why is this important for you to do? It's important because Bill Clinton is committed to putting 170 of these manufacturing extension service centers around the country, 25 of which will be committed to defense conversion. I would like to guarantee, as I set out in the comments that I made last Labor Day [1992], that I'd like an alliance for manufacturing to exist here in Massachusetts, for us to be more advanced than any other state in understanding exactly how these centers work and what we can do. And, if we are more advanced, then I think we have a much greater capacity for grabbing a piece of that pie and in making sure that we're really maximizing this economic opportunity for the state of Massachusetts.

There's no way to underscore enough the importance of our being at the forefront of the manufacturing extension service effort, and this conference could really be a seminal departure point. If you could help give this more creativity, more definition, and flesh it out a little bit with some creative ways to make this work that we may not have thought of yet, I think that Massachusetts could serve as a model. Clearly, if we're in the marketplace first and hard, we will be the beneficiaries, and we've got the best base to be there first. In many ways, we have the best financial base in the country. More private money is managed in Boston than in any other city in America. We also have an extraordinary health technology base. We have our regular high technology and computer software networks and the most remarkable educational network—from the Worcester Polytechnic Institute to the University of Massachusetts Lowell to MIT—for just a beginning.

We ought to be able to make this effort work, and there is no reason for us not to come up with a model that excels anything that any other state can do or has done to date. It's a question of your putting your heads together in the next hours and making this three day-conference really come together.

I stand prepared to work with you closely. I want to get as many dollars as I can through the NSF, through DARPA, through whatever system is set up at the national level, and I guarantee to you that there will be efforts in that area, that there will be money. I don't know how much yet, but the promise of a national effort is one that I don't think Bill Clinton can move away from. A lot of us in Congress—Joe Lieberman, myself, Jay Rockefeller, and others—are working hard to push in this direction. We're not going to lose this opportunity; I can assure you that.

I've already talked to Jay Rockefeller who will replace Al Gore as Chairman of the Subcommittee on Science and Technology, which we serve on, and we've agreed to work very closely to push some of these issues so that the iron stays hot, the door stays open, and the opportunity is there.

If you will get a really solid report and conceptualization of how we could maximize that effort at the federal level to me, I commit to you that I will go to Washington in January or even earlier, to work with our staffs to focus efforts on how we can maximize the suggestions and results of this conference.

So, here it is folks. You're looking at the future. Let's grab it and make it work.

Let's see if we can't put our people back to work and improve the outlook for New England and for the United States of America.

It's a great challenge. There's an awful lot to be done in all of these exciting fields, and my sense is that if we do well enough now, many applications will open up in fields that we haven't even thought of or even have a name for yet. New arenas will be there. So, let's go out and do it.

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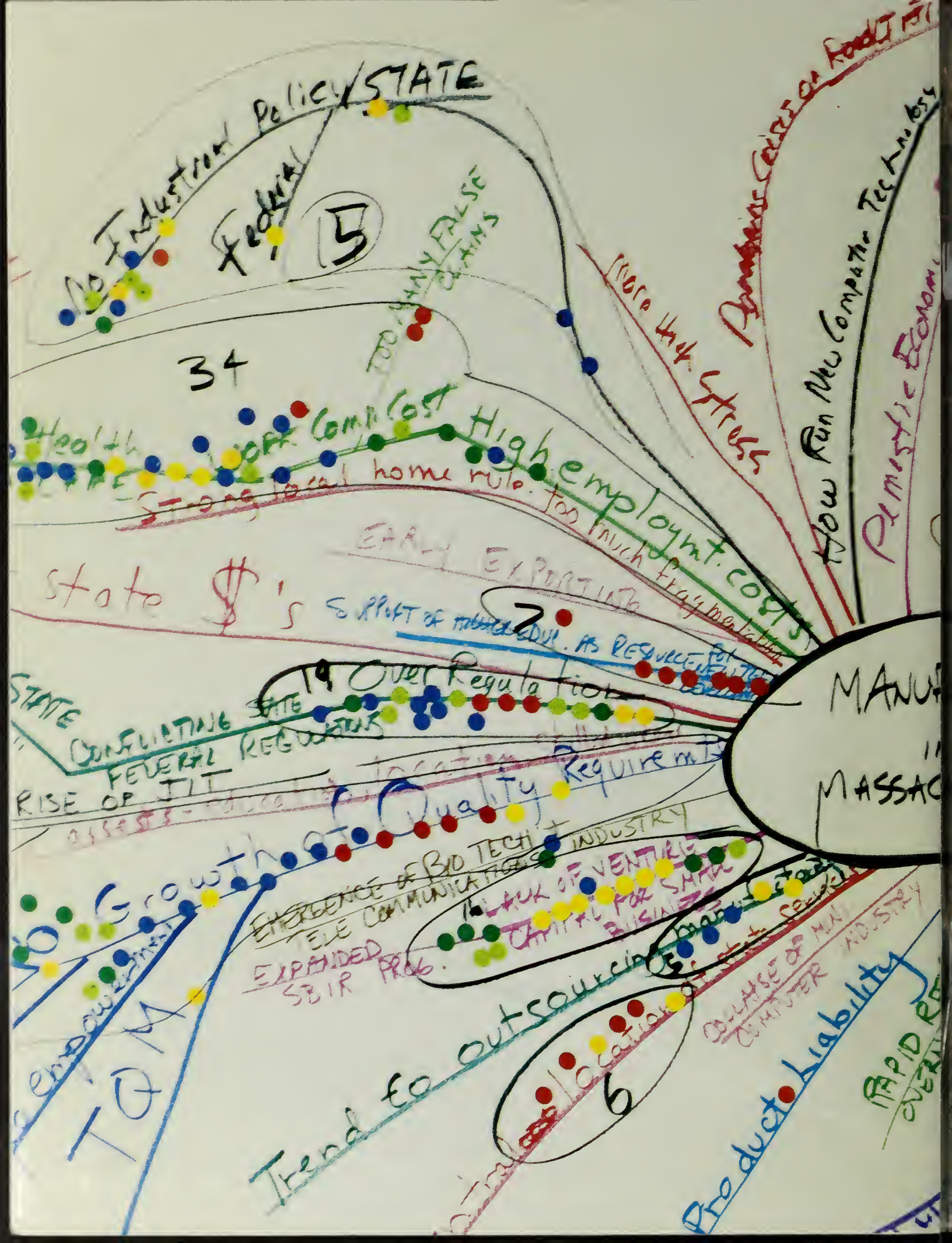
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